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ENGINEERING NEWS.

THE COMMITTEE OF THE AM. SOC. C. E., on revision of the constitution are preparing a complete new draft as a substitute in one instrument for both the present constitution and present by-laws. We hear it rumored, but not authoritatively, that their recommendations will follow substantially the lines of the draft submitted by the Cincinnati Association, published in ENGINEERING NEWS, June 22, 1889, in so far as appears to be feasible, but not following their elaborate system of geographical subdivisions. The formation of local Sections or Associations, with certain rights and privileges, will probably be legalized, the governing body enlarged, and in general a thorough revision made to bring the government of the Society into better accord with existing and probable future conditions. It will be a most fortunate result should this prove to be the case.

THE NICARAGUA CANAL WORKS are temporarily at a standstill, because of difficulties with the Nicaragua government. The company has in a measure acknowledged the jurisdiction of Costa Rica over the canal, and this has brought out serious remonstrances from Nicaragua. The affairs of the company are consequently in a rather uncertain condition. Just what Nicaragua asks of the company is not announced, but we have noted the probabilities more fully elsewhere. We do not think serious difficulties will result. Chief Engineer MENOCAL, who was announced last week to sail for Nicaragua, has postponed his departure.

AN ASIATIC SHIP CANAL is proposed to connect the Brahmapootra river in India with the Yang-tse-Kiang river in China. It is stated that the canal would enable good-sized steamers to go direct from Chinese ports to Calcutta and would greatly shorten the new route from England to India via the Canadian Pacific Railway. The chances that China would be willing to open the Yank-tse-Kiang for international navigation, however, seem to be very remote.

THE NEW SMOKELESS POWDER seems to be attracting continually greater attention abroad, and some new German manœuvres are said to have shown quite startling results. Small arms make no smoke whatever, and artillery only faint, temporary rings. Its use will greatly facilitate manœuvres in battle; but it will be harder to keep them from the enemy's knowldge.

THE LATEST SHIP CANAL PROJECT in this country is to connect Troy with Oswego, N. Y., via Oneida lake and the Erie canal. Its object would be to divert the lake traffic to the port of New York, permitting the lake steamers to go from Duluth to New York City before unloading.

THE CHIGNECTO SHIP RAILWAY excavations for the Amherst Lifting Dock are now so far advanced that it is likely that the masonry will be begun by Oct. 1. Large amounts of stone, cement, etc., are on the ground and the whole west wall will be carried on at once. By the time the foundation parts are built, the other side will be ready for the masons and, the whole will be finished at the same time. The question of weather is an important one, and on that, more than anything else, depends the date of completion, but no delay beyond announced dates is expected. The coffer-dam at the Tidnish (northern) end is finished, and machinery for pumping will be ready for operation in a week or so. During the winter the excavation there will be done, and materials brought on the ground; then, after the season opens, the building will take but a few months. The railway work proper will be ready first, and doubters will then have a chance to make their bets that a ship cannot safely be carried across. We venture to predict they will find plenty of takers.

JAPAN CELEBRATED, on July 10, the completion of 1,000 miles of railway in that empire by a grand banquet. While Japan has 1,000 miles of road, China has only 86¼ miles; but it now seems probable that before long China will have as many miles of rails as Japan. The recent decree of the Emperor of China, directing that work on a railway 700 miles long be undertaken at once, was issued only eight months after the sudden and unexpected interruption of work on the proposed extension of the Tien-Tsin line. The proposed new road is to extend southward from Pekin a distance of 700 miles to Han-Kow, a treaty port on the Yang-tse about 500 miles from the mouth of that river, whose foreign trade last year amounted to about $55,000,000. It will lie wholly in the interior of the country. If it shall be built—and the imperial decree is regarded by well-informed persons as a definite and final decision in favor of railways—other roads will undoubtedly be constructed.

THE GREAT ROCK SLIDE AT QUEBEC, on Sept. 19, is the third which has taken place at that point. The first occurred on May 18, 1841, and 33 persons were buried beneath it. On July 2, 1852, a smaller slide killed 7 persons in the same street. The scene of all these slides is the steep face of Cape Diamond, a precipitous cliff rising to a height of 333 ft. above the river. On the plateau at the top of the cliff are located the extensive fortifications, covering about 40 acres, which have given the city its title of "the Gibraltar of America. "The cliff is composed of a slaty rock of loose texture" with its plane of stratification so steeply inclined that the rock will fall whenever the strata become separated. The main business portion of the city and the tenement district is located at the base of the cliffs, which rise to a height of about 200 ft. above. Small slides have been of frequent occurrence, and to prevent danger from them, the Government bought the land along the base of the cliff and removed the buildings from it, and also built a heavy stone wall. The present slide, however, was of such immense proportions that it swept far beyond the supposed safety line and overwhelmed 8 large four-story tenements occupied by about 28 families. The total number of deaths is now placed at 48. According to the press reports, the mass which fell extended along the cliff about 600 ft., and the depth of débris is as much as 80 ft. at some points. The danger of a great fall at this point has been pointed out by engineers, but the buttresses which were recommended to prevent it were never built.

THE MOST SERIOUS RAILWAY ACCIDENT of the week, and one which seems to have been wholly due to criminal carelessness, occurred on Sept. 24 on the Chicago, Rock Island & Pacific Railroad at Englewood, a suburb of Chicago. A suburban passenger train stopped at 87th street to leave the rear car, which is taken by a dummy engine to Washington Heights. Before the dummy could be attached, a freight train, which for reasons as yet unexplained was running 10 minutes ahead of time, crashed into the rear car, and the locomotive was forced into the car for nearly its whole length. Six of the occupants of the coach were killed and 14 were injured. The blame for the accident is laid on the engineer of the freight, who is alleged to have been intoxicated at the time of the accident. The track is a tangent for some distance at this point, and it is said that the freight engine was not reversed till just before it struck the passenger coach. The engineer narrowly escaped lynching at the hands of the crowd.—Two misplaced switch accidents are reported, one on the Chicago & Northwestern at Flagg, Ill., causing a serious wreck and several injuries; and one on the St. Louis & San Francisco near Leon, Butler Co., Kan. injuring several passengers.

THE HIGH TIDES on the New Jersey coast and the heavy waves which have accompanied them, have again wrought much damage to the beaches and the property of summer residents along the shore.—In Florida a severe storm of wind and rain occurred on September 23 doing much damage.—Up to date this year, 44.18 ins. of rain have fallen at New York City, which is 11.50 ins. in excess of the average total annual rainfall.

THE ELECTRICAL SUBWAY EXPLOSIONS in this city are still being investigated, and the latest figures show that the gas companies make 8,860 million feet of gas per annum. Of this quantity it is estimated that 10 per cent., or 886,000,000 cu. ft., finds its way into all manner of cavities, such as sewers, cellars, etc., ready to make trouble at any time. One very unsatisfactory result of the investigation is that there are no laws in this city regulating the manner of laying or connecting gas mains, and that the acknowledged right to lay mains includes the "right to leak." The companies seem to regard this leakage as inevitable and are indifferent about it, as the price charged for gas discounts the waste. The city of Pittsburg, however, has laws controlling this feature, laws made necessary by the use there of natural gas with a pressure exceeding by thirty times that of common gas. The Committee on Electrical Control recommends similar legislation for New York, but say it is meanwhile essential to use fans for ventilators.

DENVER'S ELECTRIC WIRES are to be put underground. A franchise has been granted to the Western Electrical Construction Co. to build subways on the Johnstone system. St. Louis is also to be relieved from the nuisance of overhead wires, and conduits are being built by the National Subway Co.

A CHINESE ELECTRIC LIGHT COMPANY has been formed to light the city of Canton, with a capitalization of $400,000. It will be the first electric light plant ever placed in China. The machinery is to be purchased in this country next month. Several Americans are at the head of the scheme, but it is intended to raise all the necessary capital among the Chinese of this country. A circular solicits subscriptions to the stock, which is placed at $20 per share. We cannot guarantee that the affair is *bona fide*.

IMMIGRATION seems to be slightly increasing in rate from recent months, but is still well below 1888. For August there were 31,418 immigrants against 35,817 in 1888. For the 8 months ending with August the totals are very nearly 300,000 against 400,000 last year. Italy, however, has fallen from 40,000 to 18,000. English, Irish, and German emigration holds up best.

ANOTHER ATLANTIC RACER, the *La Touraine*, is being built by the Compagnie General Transatlantique at their yards near St. Nazaire, France, and is to be completed some time next year. *La Touraine* will be of about 8,000 tons burden and will have triple expansion engines developing 12,000 H. P., and twin screws.

BUSINESS MEN OF JOHNSTOWN, Pa., have raised a fund of $1,000, and will bring a test suit at once against the South Fork Fishing Club to determine their responsibility for the breaking of the South Fork dam and the consequent damage.

A MUNICIPAL FUEL-GAS SUPPLY is proposed for Chicago by the *Tribune* of that city. It urges that for domestic use especially, the gas both in economy and convenience would be infinitely superior to coal. By displacing the soft coal now so extensively used by the manufacturers, it would abolish the smoke nuisance, which is fast becoming unbearable. The system of mains and service pipes would be equally available for supplying the city with natural gas in case the pending litigation in the Indiana courts shall terminate in a declaration of the right of gas owners in that State to pipe it across the boundary line.

A CORRECTION.—In describing the great Bethlehem rock-blast, in our issue of Sept. 21, the types made us say that the daily output of the stone-crusher was 100 tons. It should have read 1,000 tons.

CRUDE PETROLEUM, to the extent of about 5,000 barrels per day, is consumed for fuel in Chicago, says the *Tribune* of that city. The new pipe line to South Chicago has a capacity of 10,000 barrels daily, and it is estimated that the actual delivery is now nearly 9,000 barrels per day, much of which is transported to points outside the city. In the use of this oil for fuel about 500,000 tons of soft coal per annum are supposed to be displaced, counting three barrels of oil as the equivalent of one ton of coal.

ELEVATED ROADS IN CHICAGO seem to make slow progress. Reports state that the Meigs Company have abandoned the enterprise and are trying to contrive some plan to get back the $100,000 deposited with the city treasurer as a guarantee of good faith. The latest enterprise in the way of rapid transit has been chartered as the Illinois Elevated Railroad Company, with N. W. RYAN, JOHN TYLER, and others as incorporators. It is claimed that plenty of money is assured for the work, and the project only awaits favorable action on the part of the Board of Aldermen.

THE PROPOSED BOULEVARD to connect Baltimore and Washington, would be about 35 miles in length. A paper advocating its construction was presented before the Baltimore Landlords' Protective Association recently by Mr. J. C. K. HEINE. It is proposed to make it 150 ft. in width, giving space for different classes of travel, including an electric railway. The cost i sestimated at $25,000 per mile.

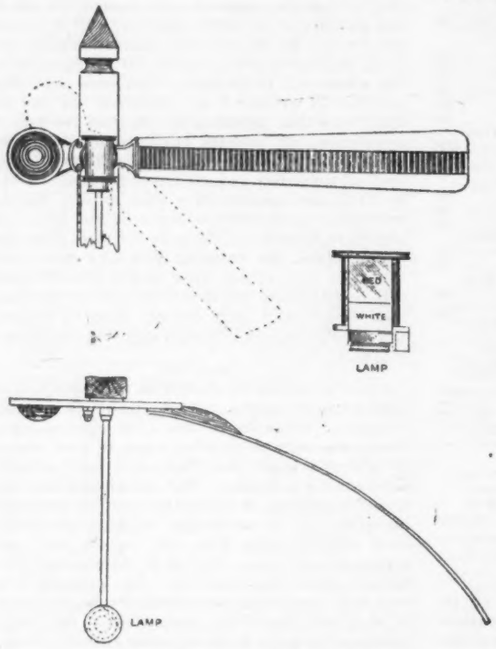
A PROVIDENCE, R. I., RAILWAY TERMINAL PLAN has been unanimously approved by the Board of Aldermen and Common Council of that city. This plan is the one presented by the N. Y., Providence & Boston, Old Colony and Providence & Springfield railways on June 13, 1889, then referred to in this journal. The special committee state that this plan will amply accommodate all the roads now entering the city and meet the approval of these roads. The city, it is estimated, will gain about $150,000 by the acceptance of the present plan.

THE EDGAR THOMPSON STEEL WORKS, Braddock, Pa., have finished an order for 500 tons of the largest rails ever rolled in their mill. Each rail is 60 ft. long and weighs 1,700 pounds. They have previously rolled rails 60 ft. long and cut them in 30-ft. lengths, but these are said to be the first they have ever finished at 60 ft.

THE SMOKE NUISANCE, resulting from the consumption of soft coal, is interesting Chicago just now in connection with the coveted selection of that city as the site for the exhibition of 1892. It was probably with this feature in view that Judge HORTON, last week, charged the grand jury to use every endeavor to enforce existing laws intended to abate this nuisance. The mixture of coke with the soft coal has been suggested as a certain preventative of smoke; but the *Tribune* claims that it requires a higher priced stoker, with a fair share of intelligence and honesty, to bring about the desired result. If Chicago wants a world's fair within its limits, it must resort to some speedy and radical remedy for getting rid of its soot-laden atmosphere. Smoke is a nuisance there now to an extent that will very seriously affect its chances for the world's fair; for Pittsburg, in its blackest days, was never quite so dreary and smoke-begrimed as is the Chicago of o-day.

The Koyl Parabolic Semaphore.

The semaphore here illustrated was devised by Prof. C. HERSCHEL KOYL and patented June 5, 1888. The purpose of this device is to render the signal not only as useful by night as by day, but also to add to its utility in the daytime by reason of the exceeding brilliancy of the arm resulting from the reflection of the sky on the arm as dropped to the position of safety.



The Koyl Parabolic Semaphore.

As shown in Fig. 1, the semaphore arm is made in a curve approximating a parabola, and it is partly covered with glass slightly corrugated to scatter the light. At night this parabolic surface is illuminated by a lamp placed in the focus of the paraboloid. This lamp is protected on the plane of the horizontal arm of the semaphore by red glass, and thus throws a strong red band on the line of the track and for a considerable distance on each side.

The lower part of the lantern being made of clear glass, the arm, when dropped to say 45°, passes out of the red rays of light and reflects the white rays. The arm itself is from 7 to 11 ins. wide, and is painted a bright red over its surface in all except the band of corrugated silver glass; this glass band is 4 ins. wide. As the mass of the arm is red in color, it can be seen in the daytime as well as the ordinary semaphore arm when in a horizontal position. And when the arm falls to the safety position, the glare from the glass band, as lighted by the sky above, makes the signal more striking than the one in common use. One of the chief advantages of this signal is that it gives the same color signals by day and by night.

A committee of the Franklin Institute, in a report from which this matter is taken, highly approved of the construction of this semaphore, and from personal examination find that it fully meets the claims made for it, and they recommend that its inventor be awarded the John Scott Legacy Premium and Medal. This semaphore has been in use for some time on the Lehigh Valley and some other railways, we understand, and has given full satisfaction.

SUBMARINE CABLES.—The strength of an electric current used to send a message over an Atlantic cable is 30 cells of battery only, equal to 30 volts.—— A break in a submarine cable is located by measuring the electricity needed to charge the remaining unbroken part.——The average cost per mile of a transatlantic submarine cable is about $1,000.—— About 100,000 miles of submarine cable are in operation, or enough to girdle the earth four times.

The Grand Canon District of the Colorado River.

To supplement the interesting description and engravings in our last issue of the route of the proposed Denver, Colorado Cañon & Pacific Railroad, we give the following abstract of some of the prominent features of the Grand cañon district as described in the reports of Capt. CLARENCE C. DUTTON, U. S. A.

The so-called Grand cañon district covers more than 23,000 square miles, mainly in Utah and Arizona. In it the mountains almost wholly disappear, and are replaced by platforms and terraces, almost or altogether flat on top and terminating abruptly in long lines of cliffs. These terraces vary in altitude from 5,000 to 11,000 ft. above the sea, and the profile presented is usually a long horizontal line dropping suddenly, at times as much as 2,000 ft., to another flat plain below. Each cliff marks the boundary of a geological series of strata, with an architecture and a play of color that are peculiarly their own. Capt. DUTTON describes "belts of brilliant red, yellow, and white, intensified rather than relieved by alternating belts of gray," and he suggests "that a painter would need to be a bold man to venture to portray them as they are."

This plateau country is also the land of cañons, in the proper meaning of that term. These are unlike the gorges and ravines found in every mountain region; they are narrow, deep trenches in the rock, with inaccessible walls. They are seldom found outside these plateaus, but are innumerable there, cutting and bisecting each other in such a manner that certain portions of the plateau are wholly inaccessible to man. Almost everywhere their drainage channels are cut down from 500 to 3,000 ft. below the general surface of the immediate country, and they ramify in all directions and every branch is a cañon. All of them, however, lead to one main drainage channel, which is cleft through the heart of the plateau region for 800 miles, and in its depth flows the Colorado river, and its principal fork, the Green river. The greater part of all these channels carry water only when the snow is melting or during the brief period of autumn and spring rains, but in this flood time they swell to mad torrents.

The region above is a barren desert, with an intense heat in all parts lying below the altitude of 7,000 ft. and air that is dry in the extreme. All vegetation is very scanty, consisting mainly of stunted sage and here and there a dwarfed and sickly cedar, seeking the shadiest nooks. Above 8,000 ft., however, the plateaus are covered with trees and the grass and wild flowers grow without stint.

The popular idea is that the rivers themselves slowly carved out these deep channels in the rocks and sunk to their present level, regardless of the bewildering time-factor that would be required by such an erosion theory. Capt. DUTTON answers this question by denying that rivers ever do anything of the kind. The rivers were born with the country itself. When the land rose from the sea, rain, and melting snows sought the lowest points among the natural inequalities of the new surface and the waters pushed forward until they met the sea. But once established in its bed, a river maintained its position by force of its own hydraulic power, working with such tools as it found in the sand, gravel, and silt carried along in its waters. As the land slowly rose and the mountains grew, the rivers fought their way downward with a power increasing as the fall increased; and if the mountain presented a barrier and formed a lake, it was only to later store a power that would in time cut away the rocky barrier. The courses of these cañons are everywhere laid independently of the topographical inequalities, cutting through plateaus, mesas, and terraces indiscriminately, and leaving the present surface to be accounted for by later displacement or unequal lifting.

The Grand and Marble cañons lie in the western

division of the plateau district here described, nearly all in northern Arizona. Capt. DUTTON, in describing a type of the Grand Cañon district, says that the plan and section is quite simple as a type. There is first a broad chasm from five to six miles in width, with walls varying little from 2,000 ft. in height. Between these cliffs lies a valley, smooth in appearance, when compared with the rocky masses that bound it; but in this floor is cut the inner chasm, 3,000 ft. deep, and from 3,500 to 4,000 ft. wide from crest to crest. The stratum cleft through all belongs to the carboniferous age, except 300 or 400 ft. at the bottom of the gorge. Roughly sketched and commencing at the top of the wall of the upper chasm, the geological strata come in about the following sequence: Limestone of varying kinds, 750 ft.; sandstone, 250 ft.; then a thinly bedded, shaly sandstone, 1,000 ft. thick, of an intensely brilliant red. But this lower stratum is in great part covered by a heavy talus of imperishable cherty nodules, fragments of the sandstone and spalls of limestone from above. The color of the upper strata is a pale gray with an occasional yellowish or creamy tinge.

The walls of the inner chasm commence at the top with about 325 ft. of a hard, brown-red sandstone; beneath this is about 1,800 ft. of impure limestone in ponderous layers, deep red in color with purplish tones; still lower the red-brown sandstone again appears in massive beds down to the bottom. Capt. DUTTON explains the double chasm by assuming that at one time in the world's history the upper broad esplanade was the bed of the Colorado river, and the limit of erosion was for a time reached; then for a long period the palisades on either side wasted and receded from the river. At last another epoch of upheaval set in, and the entire platform of the district was lifted several thousand feet, and the cutting power of the river was again restored, and it held its own against the constantly growing banks until the second deep chasm was cut.

As set forth in figures, the Grand cañon of the Colorado is more than 200 miles long, from 5 to 12 miles wide, and from 5,000 to 6,000 ft. deep. The fall of the Colorado and its principal fork, the Green river, from Green River station, on the Union Pacific, to the end of the Grand cañon, is about 5,150 ft., in a distance, as the river runs, of about 1,050 miles. The general average fall is thus about 5 ft. per mile; but through the Grand cañon the average is 7.56 ft. per mile.

The Marble cañon has a length of 65.2 miles and a descent of 510 ft., or an average fall of 7.82 ft. per mile. When compared with the declivity in the middle and lower course of other large rivers, that of the Colorado is seen to be very excessive. The fall here given means a succession of rapids and a rush of waters that, taken in connection with the immense quantity of sand and clay with which this swift-moving flood is charged, explains the rapid erosion of the river bed. As showing what water will do under somewhat similar conditions, Capt. DUTTON mentions that at the Bloomfield hydraulic mines in California he saw a gash 12 ft. deep, cut in the solid basaltic rock, which he was assured was made by the "tailing" flow of sand, gravel, and water in about 16 months, the actual running time of the water being equivalent to 145 days of 24 hours each. This phenomenal rate of cutting is cited only to illustrate the efficiency of a rock-cutting stream under the most favorable conditions.

Rock Asphalt Pavement.

The laying of the asphalt pavement in the plaza in front of the City Hall, New York, is an interesting piece of work, and it may be taken as an indication of the growing feeling in favor of the use of good and durable paving, even at an increased first cost.

The material used is the Seyssel rock asphalt, which is laid in the manner adopted for sidewalks, being mixed with melted bitumen and clean sharp grit, put down hot and rubbed to a smooth surface. In ordinary cases the practice is to put a single layer of asphalt, ¾-in. thick, upon a concrete base, but in this case it was desired to avoid the tearing up of the old tar pavement, and so two coats of the asphalt are laid, the first being to bring the old irregular surface up to the proper grade, and upon this the second or wearing coat is laid. In general it is not well to lay the asphalt over the tar paving, as the heat of the asphalt composition, about 340°, melts the tar, which, being lighter than the asphalt, rises through it and comes to the top. In this case, however, the paving was so old and the tar so thoroughly dried and hardened, that no trouble of this kind was experienced. The first coat is not brought to a fine surface, but the second coat is thoroughly smoothed by rubbing.

When first laid, the asphalt pavement is black, and to give it a more pleasing appearance it is sprinkled with some light material, which gives it the desired effect until time and the action of the weather has brought out the natural greyish color of the asphalt. For this purpose the finest marble dust or limestone dust is used, or sometimes Portland cement. In the City Hall plaza, however, a fine white material known as actinolite, imported from Canada, is used.

The pavement is laid in strips, the joints being carefully made and rubbed, so that after a little wear they will scarcely be visible. The general appearance of this pavement is very pleasing. The contractor is E. H. WOOTTON, of 35 Broadway, who is the general agent for the United States and Canada for the French company which owns the mines from which the Seyssel asphalt is quarried. Mr. WOOTTON also has the contract for the artificial stone pavement which is being laid on the broad platform at the foot of the marble steps leading up to the City Hall.

Rock asphalt is extensively used in Europe for street and sidewalk paving, but as yet it has only been adopted in this country to a small extent for sidewalks, and for roofs, cellars, etc. For street pavements no melted composition is used, the crushed and powdered rock being spread over the concrete foundation and well tamped by hot irons, consolidating it at a temperature of about 240°. This makes a very superior pavement, durable, noiseless, and of pleasing appearance. It is proposed to lay it in some of the streets in this city, under the new appropriation for street improvement; but it is intended to lay it over the present stone paving, a cement coating being laid to give the necessary smooth surface. As the coat of asphalt, however, is only the wearing surface, the weight and strain of the traffic is likely to crack the cement "plaster," and thus lead to the destruction of the pavement. The proper way is to build the whole pavement properly, laying a good concrete foundation course to carry the asphalt wearing surface. The first cost may be a little more, but the work will then be reliable, and it will pay for the extra cost by its economy and durability.

It may be explained that the difference between rock asphalt and Trinidad asphalt is in the proportion of the ingredients in the natural product. The former contains about 88 per cent. of carbonate of lime and 10 per cent. of bitumen; the Trinidad asphalt contains a much greater percentage of bitumen, which results in making the material semi-plastic.

American engineers who have traveled in the larger cities of Europe have been struck with the advantages of this asphalt pavement; and as its reliability and durability have been well established, it is be hoped that some of our finest streets in New York may be thus paved before the time of the World's Exposition. The present condition of most of our streets and sidewalks is such as to fill a foreigner with wonder that the inhabitants of so great a city tolerate their condition.

A Deep Water Harbor on the Gulf of Mexico.

The Deep Water Convention which is to assemble at Topeka, Kan., Oct. 1, promises to be the most important assemblage yet held to agitate this interesting subject. The movement should not be confused with that which has for its object the improvement of the Western water-ways. The object of the convention which is to meet at Topeka is to create a new port on the Gulf of Mexico which shall control the whole export trade of the Mississippi valley and save the long rail-haul to ports on the Atlantic seaboard.

The movement originated a year ago with the Boards of Trade of Fort Worth and Denver, and two conventions were held, one at Fort Worth July 10, and one at Denver Aug. 28. The latter was attended by over 700 delegates, representing 13 States and Territories west of the Mississippi. Through its efforts a bill was put through Congress requiring a board of United States engineers to examine the Texas coast and determine the most favorable site there for a deep water harbor, able to accommodate ships of the greatest draught. The surveys are finished and the Board of Engineers are nearly ready to make their report.

Secretary DANA, of the Deep Water Committee chosen at the Denver meeting, makes the following statement of the benefits to be derived from the proposed harbor:

The difference in favor of the Gulf over New York from twenty States and Territories amounts to 13,035 miles, averaging 651 miles from each. The cost of transportation by rail averages three-fourths of a cent per ton per mile; therefore, by saving 650 miles of rail haul we save $4.88 per ton upon our surplus products. It is apparent that if the West's surplus of breadstuffs and meats of 1888, amounting to 24,935,235 tons, could have been shipped via the Gulf, the enormous sum of $121,683,946.80 would have been saved. We challenge the world to show another investment of $10,000,000 (the amount estimated as necessary to build a perfect harbor) that will bring in such grand returns.

There seems every prospect that the West will unite to secure a large appropriation from Congress to make the desired port on the Gulf; and the eventual diversion of the traffic by that route may be very considerable. It is always a difficult matter to change the course of trade, however; and it will take a good while for the new Texas port, wherever it may be, so to establish itself as to divert any appreciable amount of export traffic from the north Atlantic seaboard.

Probably one great effect of such a port would be to further the rapid growth of Texas, Louisiana, Arkansas, and the Indian Territory. The hot climate which must be encountered seems likely to be a great obstacle to the shipment of any great quantity of cereals from the Northern States via this route. Their more natural outlet by water is through the Great Lakes.

Vibration in Buildings.

One of the most perplexing problems that confronts the engineer is the vibration in buildings caused by running machinery. Messrs. Westinghouse, Church, Kerr & Co., of New York, being frequently called on to locate Westinghouse engines on the upper floors of buildings, have had considerable experience on the subject, and much occasion to study it. They find that the character of the building, the ground it rests on, the weight, power and speed of engines are all important factors which must be considered, combined with which is the very important factor of the relation which the speed of the engine bears to the natural time of vibration of the floor beams. It is evident that if the slight motion which every engine has is exactly in time with the natural vibration of the floor beam, each pulsation of the engine will increase the scope of the vibration of the floor, resulting in a most disastrous shaking, while if the pulsations of the engine are in discord with the floor, comparative quiet will exist. As floor beams are usually long, and their time of vibration correspondingly long, it is usually found that a fast-running engine will give less of its vibration to the floor beams than a slow-running one. It is also worthy of note that the vibrations of a fast-running engine are more numerous and less forcible, hence more easily resisted by the mass of the floor.

An interesting example of preventing vibration by discord was shown in the case of a Westinghouse 10 H. P. engine, which, on an upper story of a silverware manufactory, created such a commotion as to rattle the silver-ware on the shelves 100 ft. distant. A change of 25 revolutions in the speed, which change was in the direction of increasing of the speed, entirely stopped the vibrations.

An interesting instance of this kind, also, is in the great coffee house of Arbuckle Bros., in Brooklyn, where two Westinghouse engines of 125 H. P. each and one of 45 H. P. are located on the fifth floor. These engines were erected on the heavy floor timbers, the floor boards being cut away, and extra timbers being inserted between the joists. Across said timbers were placed oak stringers,

which latter have been seasoning since the war in some unfinished vessels in the Brooklyn Navy Yard. On these the engines were mounted with plain fly wheels, and experiments were conducted to determine the speed at which it would be best to run. It was found that at 204 revolutions the vibration was at the minimum and was very slight, being as little as that caused by any of the ordinary driven machinery, while a higher or lower speed increased it. The speed was therefore fixed at this point, and the wheels then made to give the proper belt speed.

The erection of engines as large as this on upper floors is somewhat of a novelty, and should only be undertaken with full consideration of the surrounding conditions and with engines which are completely balanced.

The Pearsall Hydraulic Engine.

We illustrate herewith the new hydraulic engine, designed and patented by Mr. H. D. PEARSALL, of Orpington, Kent, England. An engine of this type has recently been erected at Barneston, Chester Co., Pa., for the Isabella Furnace Co.

The principle of this engine is very simple, being the same as that of the common hydraulic ram.

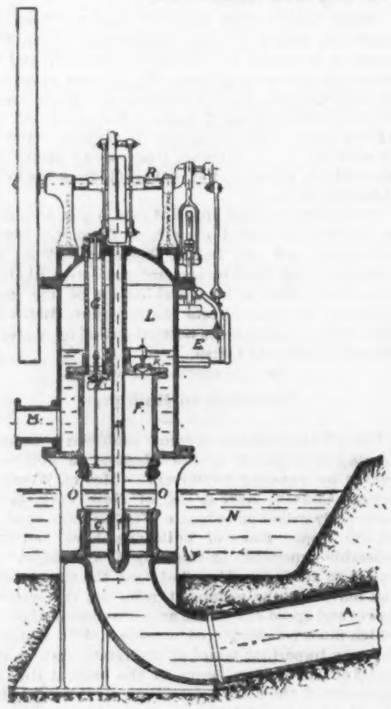


Fig. 1. Pearsall's Hydraulic Engine; Vertical Section.

But though the main principle is the same, the Pearsall engines are so different in construction from the ram, and their action is also so different, that the name of "ram" is inappropriate for them.

The principle which the ram and this hydraulic engine share in common is that they both obtain their pumping power by the arrest or retardation of a column of water which has been previously set in motion by gravity; but in the hydraulic engine the flowing water is so controlled as to save the moving parts from all shocks and blows, and therefore the machine is not so subject to wear and loss of efficiency as is the ram

The action of the engine may be easily understood by reference to Fig. 1. The main valve *C* being shut and the pipe *A* being full of water, the shaft *R* is caused to revolve. A cam on the shaft, in the course of its revolutions, opens the main valve *C*, allowing the supply water to escape freely through the orifice *O*, until, by the continued revolution of the shaft, the cam again closes the main valve C. During this closing, the water rises freely into the ante-chamber *F*, so that there is no increase of velocity through the orifice *O*, and so no loss of power occurs during the closing of the orifice.

While the water is flowing into the ante-chamber *F*, the air in that chamber escapes freely through the passage *G* until the water reaches the float *H* by which it then closes the air valve *J*. The passage leading to this valve is lined with a tube which is attached to a rod, and can be raised or lowered to any height in the ante-chamber according as it is desired to retain more or less air therein. In pumping water this dipping tube is raised to its highest position, when nearly all the air escapes. A very small quantity of air is left in the chamber when the water reaches the tube, and this is then compressed to a pressure equal to that in the air vessel *L*, when the valve *K* is forced open, and the air and some of the water pass into the air vessel. The water continues to flow through this valve until its force is spent against the resistance of the compressed air in the air vessel, whereupon the valve *K* sinks back to its seat. At this point the main valve *C* is timed to open again, when the water flows out of ante-chamber *F*, the air valve falls open, and air enters, and the round of operations commences again. The compressed air in the air vessel *L* insures a steady outflow of the water through the delivery pipe *M*. The small amount of air that is forced through the valves *K* is used to work a small motor *E* by which the main valve is raised and lowered.

It is important to note that the action of the water described above takes place without any blow or water-hammer, which is such an obvious feature in hydraulic rams. Ocular proof of this fact is afforded by the indicator diagram in Fig. 3, which is a sample of many taken from the ante-chamber of the engine at Barneston by a Crosby indicator. Correcting this diagram for what is obviously instrumental vibration, it indicates that the maximum pressure in the ante-chamber was 46 lbs., or only 2 lbs. more than the resistance in the rising main.

When these engines are built for air compressors, the ante-chamber *F* is made larger and the dipping tube reaches nearly to the bottom. As soon as the water reaches this tube, it cuts off the escape for the air, so that all the air in the ante-chamber, above the lower edge of the tube, is compressed; and as the position of the tube can be adjusted so as to make this quantity exactly that which the available power can compress, only air and no water is forced into the air vessel *L*. The water meanwhile flows up to the tube, and shuts off its own escape by pressing up the float *H* and shutting the valve *J*.

This engine is started, if there is air of high pressure already in the air vessel, merely by moving the crank over the dead point. If the air vessel, however, is empty, it can be charged with air at any desired pressure in a few turns of the shaft. In engines for pumping water the dipping tube is first lowered, which converts the engine temporarily into an air-compressor. The fly-wheel is then first turned by hand for a few turns. In about one minute sufficient air has been forced into the air vessel to raise the pressure high enough to work the engine, and in two minutes a pressure of 45 lbs. is obtained. When the desired pressure is reached, the dipping tube is raised and the engine pumps water only.

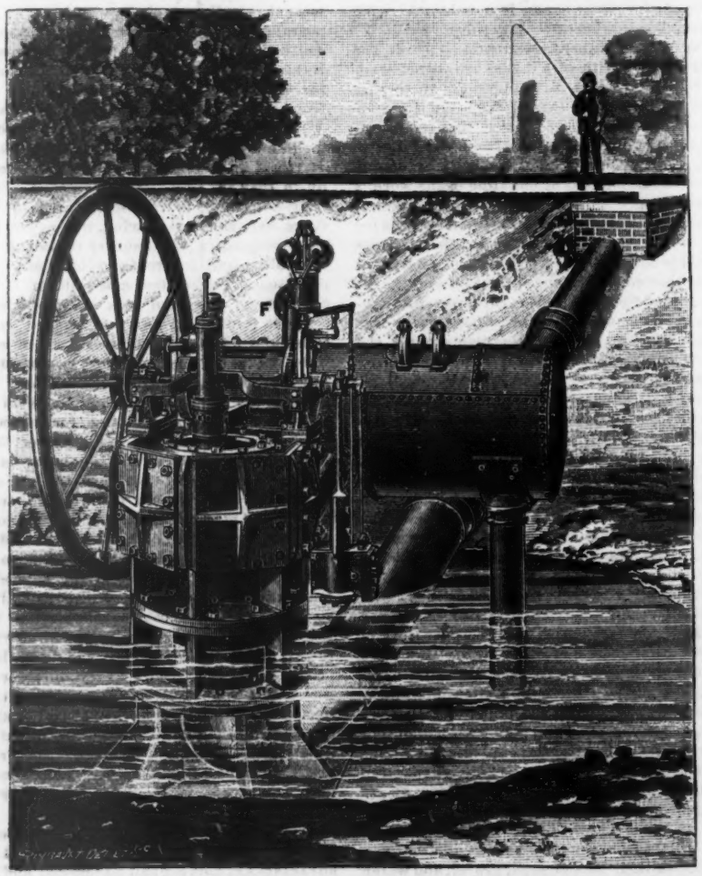


Fig. 2. Pearsall's Hydraulic Engine; General View.

There is an important novelty in the construction of the main valve. It is a cylindrical valve actuated by the rod *B*. In closing, it is drawn up near to its seat, but barely touching it. The seat itself is a rubber curtain, and the instant there is any internal pressure it presses the edge of this curtain against the edge of the valve, thus making it tight. Not only, therefore, is there never any concussion whatever of the valve on its seat, but the durability of the seat is very greatly increased by not being subjected to the same compression as would be necessary if the tightness of the valve depended on its being pressed against its seat. Another incidental advantage of this form is that floating rubbish coming in with the water cannot injure the valve, as the free curtain form of the seat allows of a large stick, even, being caught in the valve without any injury resulting.

The engine which was lately erected in Pennsylvania is constructed as above described for pumping water; and it showed an efficiency of 71 per cent. under test. Mr. PEARSALL is confident of obtaining an even higher efficiency in cases where the circumstances are equally favorable.

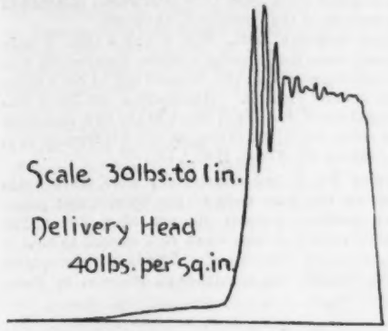


Fig. 3. Indicator Card from Pearsall's Hydraulic Engine.

The principal data concerning this engine and the work it performed during a 3-day test are as follows:

The supply pipe is 12 ins. diameter. The discharge pipe is 4 ins. diameter, has 6 bends and one straight-way gate, and is 610 ft. long. The head of water in supply pipe (vertical distance from surface of water in supply reservoir to centre of waste-water discharge) is 17 25 ft. The static head against which the engine works is 92.7 ft. The equivalent additional height that water is lifted, due to the friction in 610 ft. of 4 in. pipe, is (by Weisbach) 6.91 ft.

The equivalent additional height that is lifted, due to friction in six bends, is assumed to be 1.00 ft., making the total head against which the engine works 100 61 ft., which produces a pressure of 43 67 lbs. per sq. in. This calculation is substantiated by the indicator diagram, which shows a pressure of 44 lbs. per sq. in.

The quantity of water delivered per minute into storage reservoir is, in gallons of 231 cu. ins. actual measure, the average of a number of tests, 125.00 galls.

The quantity of waste-water from engine per minute, weir measurement, in gallons of 231 cu. ins., 901 800 galls.

Therefore the total number of gallons of 231 cu. ins. used by engine, per minute, is 1,026.80 galls.

The efficiency of the engine would be, therefore, as follows: 10.36 8 galls. × 17.25 = 17,712.30 ft. galls. 125.0 galls × 100.61 ft., 12,576 25 ft.-galls. From this it appears that the engine shows an efficiency of 71 per cent. and a performance of about 36 H. P.

The uses to which this efficient and ingenious machine is adapted readily suggest themselves. Probably the most important is their use in connection with water supply in almost every place where water-power is used for pumping. The efficiency of a fairly good turbine connected by gearing to a pump may be set at 40 per cent. Probably most of the hydraulic pumps in use fall considerably below this figure. This engine promises to do this work with 50 per cent. greater efficiency at least. It is a cheaper machine in first cost, it requires less care and attention, and its wear is very much less. There are few moving parts, and these move slowly; the ordinary speed of these engines is about 25 strokes per minute.

Among the special uses for which Mr. PEARSALL believes this engine to be especially adapted are sewage pumping, irrigation, utilizing tidal power and lock discharge on canals, hydraulic mining, and supplying a high-service water-works system from the flow in a low-pressure system. For the latter purpose, it would probably require some change in its design to permit it to stop and start automatically, give a continuous supply to the low service, and meet other requirements. In this connection we would refer interested readers to another motor for this purpose described and illustrated in ENGINEERING NEWS of Oct. 1, 1887.

The second important use for which this engine is adapted is as an air-compressor. In compressing air by reciprocating pumps, the efficiency hitherto obtained is even lower than in pumping water on account of the impossibility of completely cooling the air during compression. In these engines compression takes place under exceptionally favorable circumstances in these respects, the whole surface of the compressing chamber being cooled with fresh cold water at every stroke, the piston being a mass of cold water, and the period of compression being comparatively long. The result, as might be expected, is a compression almost perfectly isothermal; and consequently, there being no waste of power in this way, the efficiency of these engines when compressing air is said to be as high as 75 or 80 per cent.

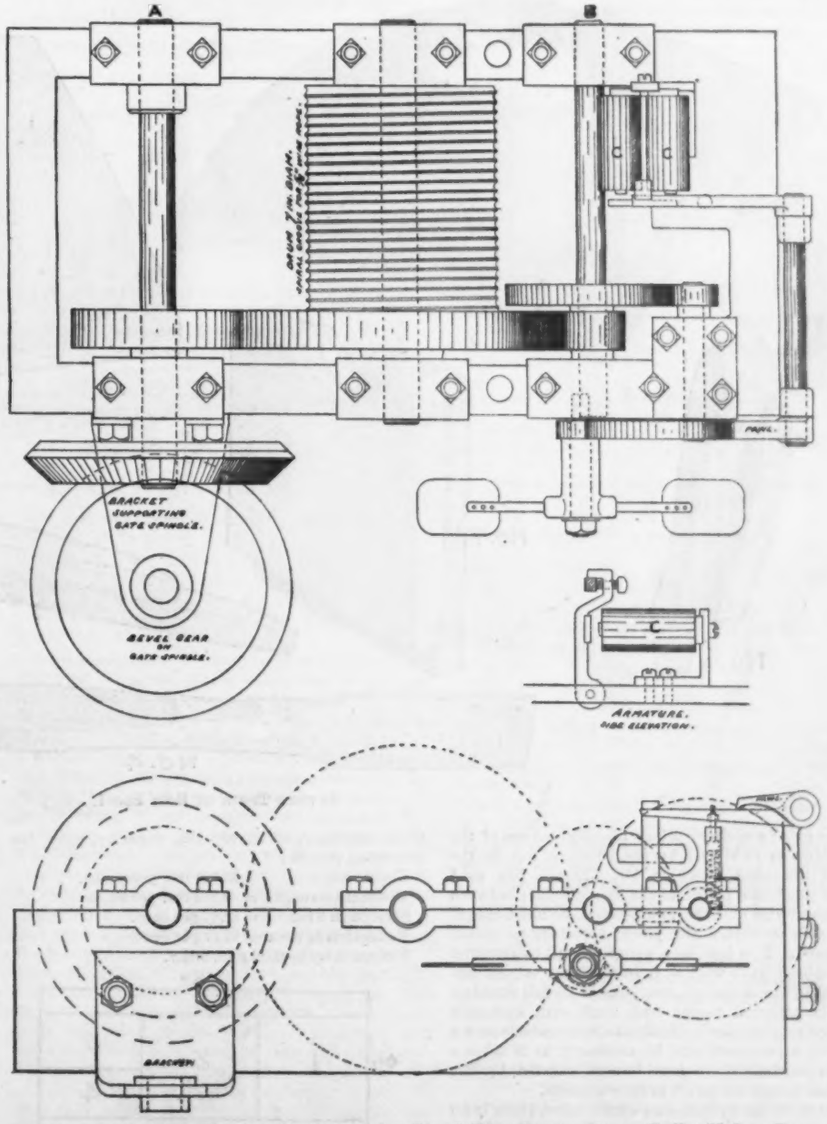
For the cases where hydraulic power is available for use in tunnel work, this machine would seem to be especially adapted. There are many mining plants, also, where compressed air is used, which could adopt this motor to advantage. The inventor also believes that where large water-powers are at some distance from the point where their force can be utilized, this machine can so economically compress air that it may be profitably carried to the point where its use is desired.

Automatic Gate-Closing Appliance for Stand-Pipe Connections.

In reply to inquiries of our readers concerning the appliance for automatically closing the gate on the stand-pipe connection, as alluded to in the description of the Janesville Water-Works, published in our issue of Aug. 20, Mr. B. R. CLARKE, President and Designing Engineer of the Janesville Water Co., favors us with the accompanying drawings and description of the apparatus there used for that purpose, which is found to give excellent satisfaction.

Referring to the illustration herewith given: The connection to the stand-pipe (which at Janesville is 10 ins. in diameter) is provided with a gate at a convenient point outside of the stand-pipe foundation, and around the gate is a by-pass 8 ins. in diameter bearing an 8-in. check valve, opening outward from the stand-pipe. Around the gate and check-valve is a pit some 6 ft. square, laid up with brick walls, the pit being housed over. The gate is provided with a long spindle bearing a bevel gear engaging in a second bevel gear of the same diameter, as shown in the plan.

The power for closing the gate is furnished by iron weights supported by a ⅞-in. wire rope, the standing part of which is attached to a single block suspended to a beam over head, then through a single block on the weights up through sheave of the upper block, the fall part being wound around the grooved drum shown in



Automatic Gate-Closing Appliance for Stand-Pipe Connection. Coffin Valve Co.

In our illustrations, Fig. 1 is a sectional view of the first engine erected. The details of construction have been somewhat altered, but the main features and principle of the machine are the same, and are well shown by the engraving. Fig. 2, which we reproduce from *Engineering*, shows a perspective view of a machine erected at the paper works of W. Joynson & Son, of St. Mary Cray, Kent, England. Fig. 3 is one of the indicator diagrams taken from the engine at Barneston, Pa., during the tests above described.

the plan. The 10-in. gate at Janesville is closed in one minute, using 210 lbs. weight, the same falling through 18 ft. of space into the pit below. At the pump house is maintained a battery of 20 cells connected by a single No. 8 iron wire with the machine at the stand-pipe, a distance of about 1¼ miles.

When the machine is wound up, the gate is wide open, and upon receipt of an alarm at the pump house, the engineer throws over a small double-pointed switch, and the circuit being thus completed, the armature is attracted to the coils, thus releases the lever attached to the rock shaft holding the pawl, the lever, when thus released from the armature, being thrown up by a small plunger spring, releasing the pawl from its wheel, thus setting the train in motion and closing the gate. At *A* and *B* on plan an extension of the shafts is made, with a square head for attaching a crank for winding up the gears and opening the gate. Either may be used as required, the two being provided for difference of power.

The plans and descriptions above given are of the machine as produced by the builders; but in the three instances in which Mr. CLARKE has used these machines, owing to the long distance between the stand-pipe and the pump-house, he has found it desirable to reduce the power necessary to release the pawl. This has been accomplished by tripping a weighted yoke with a li ht-working trigger operated by the armature, the yoke in its fall striking a lever attached to the rock shaft with sufficient force to trip the pawl. He thinks in most instances a similar attachment will be necessary, as it takes a power equivalent to four ounces exerted by the magnet to trip the pawl, as shown above.

Owing to the by-pass and check valve, there is no necessity for reopening the gate immediately after a fire, as in case of stopping the pumps, the town would continue to be supplied from the stand-pipe through the check valve on the by-pass.

The machine as shown is made by the Coffin Valve Co., of Boston, Mass., and with the alteration alluded to above, Mr. CLARKE states to us that it has proved thoroughly satisfactory.

A RACK RAILWAY ON THE ABT SYSTEM is projected to connect the town of Jalta in the Crimea with the top of Mount Magabi, a health resort 3,000 ft. above the sea.

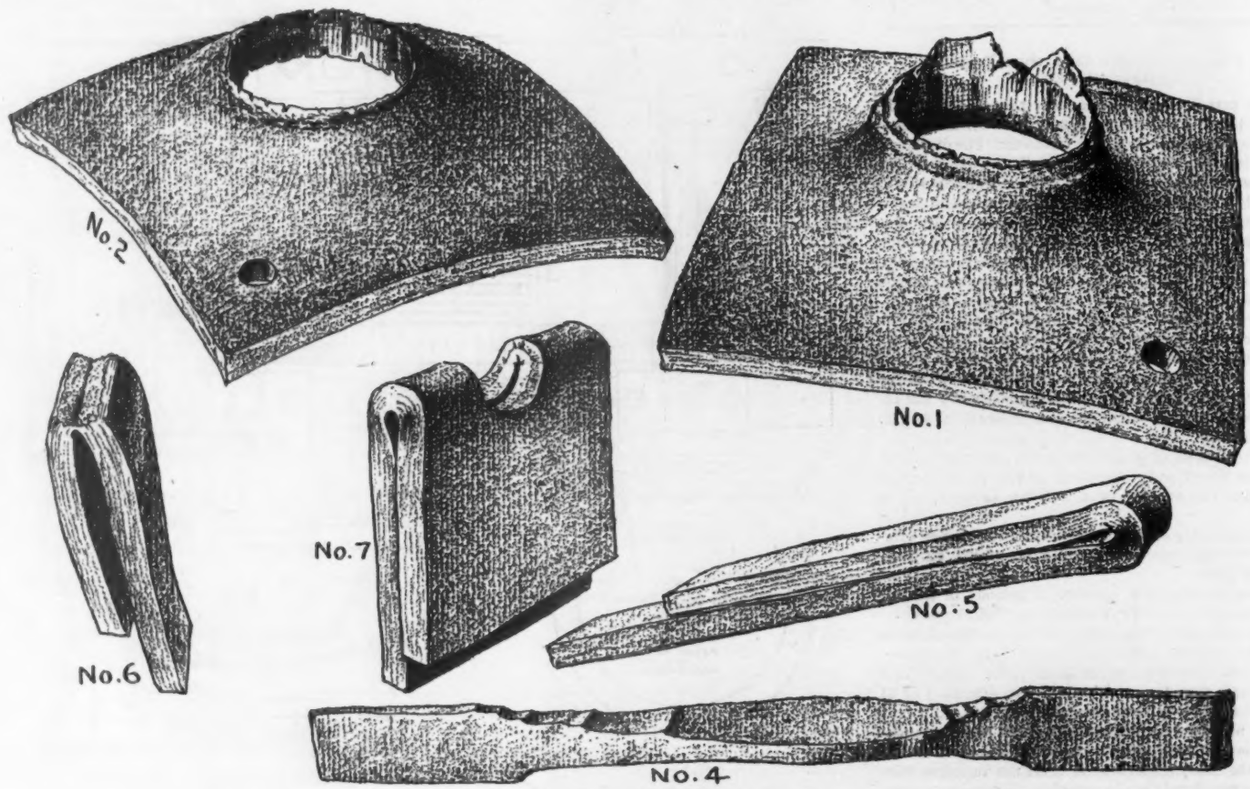
Severe Tests of Soft Steel.

We are indebted to Mr. A. C. CUNNINGHAM, C. E., inspector, with G. W. G. Ferris & Co., of Pittsburg, Pa., for the accompanying report of some interesting tests which he has recently made on soft, low phosphorus steel to determine its physical properties and the amount of mechanical abuse to which it can be subjected. All the nine test-pieces referred to are now in this office, where they may be inspected by the curious, and the appearance of five of the most significant specimens is reproduced in the accompanying engravings as faithfully as possible.

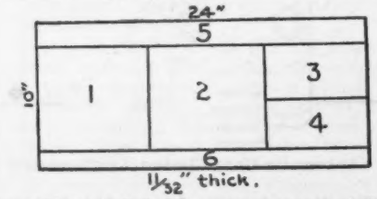
The tests were made on basic, open-hearth steel, manufactured by Carnegie, Phipps & Co., of Pittsburg, Pa. The analysis of the steel showed the following: Carbon, 0.13c; phosphorus, 0.012c; manganese, 0.24 p.c.

The tension test, pulled on the latest improved Olsen machine, of 200,000 lbs. capacity, gave the following results:

Elastic limit	35,740 lbs. per sq. in.
Ultimate strength	= 49,940 lbs. per sq. in.
Stretch in 8 ins.	= 33.25 per cent.
Reduction of area	= 67.27 per cent.
Fracture, irregular, fine, silky.	



Severe Tests of Soft Steel.



Severe Tests of Soft Steel. Arrangement of Test Pieces.

The drop of the scale beam at the elastic limit was very marked.

Fig. 1 shows the manner in which the tests were cut from the original plate: Nos. 1 and 2 for drifting; Nos. 3 and 4 for bending with punched hole; No. 5 for tension, nick, and welding tests; No. 6 for cold hammer tests.

Drift tests Nos. 1 and 2 (both illustrated) were made on specimens originally 7¼ x 7 ins., having planed edges, and with a 7-16 in. hole punched in the center; they were drifted with a series of four drifts to a diameter of 2⅛ ins., as described in our issue of May 18, 1889. In test No. 1 the drifts were driven entirely in one direction, and in No. 2 the second and fourth drifts were driven from the convex side; the original sized holes were afterwards punched in the corners of the specimens, as shown.

Cold hammer tests, Nos. 3 and 4 (No. 4 only shown), were made under a steam hammer by continuous hammering, the sheared end of No. 3 being first ground smooth. Hammering on No. 3 was stopped when the slight crack at the end appeared. The reduction of thickness on No. 3 is from $\frac{23}{32}$ to $\frac{3}{8}$ in., and on No. 4 from $\frac{23}{32}$ to $\frac{5}{16}$ in.

Tests No. 5 (not illustrated) were scarf welds made on the butt ends of the tension test pieces after pulling, without the use of a flux. The shorter piece was bent when cold enough to hold in the hand, and then cut off. The longer piece, after being welded, was quenched in water at 82° Fahr. from a light cherry-red, and then bent. Both specimens would hardly be suspected of having been welded at all, and show a perfect cold bend through 180°.

Piece No. 6 was nicked on one side with a sharp cold chisel, and then bent; instead of breaking suddenly, like the harder steels, it tore open gradually, requiring considerable force to bend it, and finally closed down without complete rupture, as shown.

Pieces No. 7 had 15-16-in. holes punched in them, and were then closed down tight about the diameter of the hole, the side from which the punch entered being out.

These simple and inexpensive tests, with the exception of Nos. 5 and 6, are applicable, in varying degrees, to all grades of steel, by making proper allowance for the carbon and phosphorus, and will develop in a clear and evident manner the comparative malleability and ductility of the metal. Nos. 3 and 7, which require the least preparation of all, are the most severe.

Nos. 5 and 6 are not applicable to the harder grades of steel, as welding, by the ordinary methods, is attended with indifferent success, and when nicked, the metal breaks suddenly from a slight shock.

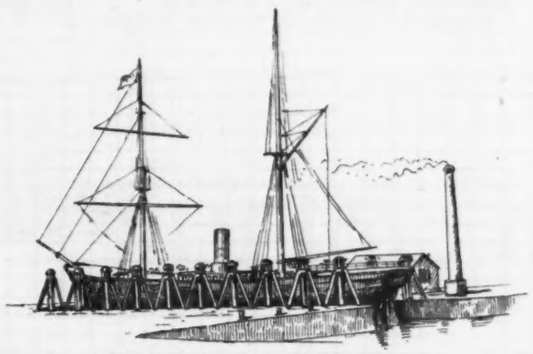
It will be at once evident that the steel must have been of fine quality to give such excellent results.

The Chignecto Ship Railway Lifting Docks.

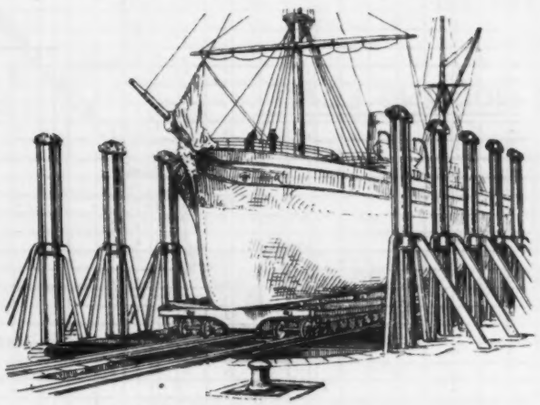
We regret that it is impossible for us to give the further information in regard to this new project promised in our issue of Sept. 7. The company are unwilling that it should appear, as we explained in part in our former article, the chief reason advanced being that the project is new in type, and they may desire to make certain changes. As most of the plant for the lifting docks and for the work generally is already delivered, there can hardly be any great changes of this kind, however, nor are any likely to be needed, for there are several other much larger lifting plants already in existence which have been fully described and have worked successfully for years.

To give our readers some idea of the nature and magnitude of the plant, we give herewith two general views of the lifting docks, as they will appear when complete. Being designed only for vessels of 1,000 tons or less, the plants are not large, as will be seen, and they need not have and will not have any especially novel features. The novelty will lie in the conveyance of the ship across the country for 17 miles after it has been lifted; and we entertain no doubt that this will be as successfully done as has been the mere lifting for years of laden vessels of four or five times the size of those which it is proposed to transmit over this line.

We give in another column a note of the progress of the work, which will be seen to be quite rapid. By the end of next season we shall expect to see the works substantially complete, and then, if not before, will give all further technical details of general interest.



Lifting Dock for Chignecto Ship Railway.



Hydraulic Lift for Chignecto Ship Railway.

Graphical Method of Calculating Bridge Strains for Concentrated Loading.

By WARD BALDWIN, Prin. Asst. Engr., C. N. O. & T. P. Railway.

In the valuable paper on "American Railroad Bridges," read by Mr. THEODORE COOPER at the Annual Convention of the American Society of Civil Engineers, an abstract from which was reprinted in ENGINEERING NEWS of July 6, the lack of accuracy in using equivalent uniform loads in place of the actual wheel concentrations is clearly demonstrated; and the analytical method in common use for determining the maximum shears and moments for the actual wheel concentrations is succinctly stated. This method is also fully explained in BURR'S "Stresses in Bridge and Roof Trusses," edition of 1888.

The advantages, as shown by Mr. COOPER, in using the actual wheel concentrations is not that the individual strains may be found with mathematical accuracy, but that the correct relative proportion of the several parts of the bridge is thus secured, for the assumed loading.

The objection to the use of typical train loads is the labor involved in treating the load on each wheel separately. This labor may be greatly reduced by the analytical method given by Mr. COOPER; but even with this method, considerable arithmetical work is necessary.

Now the desideratum being to find with the least labor the correct relative proportions of the several parts, and the strains on the individual members, to a close but not absolute degree of accuracy, it would appear that the graphical method is peculiarly adapted to this purpose.

It has been the custom of the writer to use a graphical diagram for ascertaining the maximum strains in bridges, and this method has been found sufficiently accurate for all practical purposes, reducing the liability to error and the arithmetical work to a minimum.

The diagram for any given load may be made in a few moments on a piece of profile paper as follows: At the top lay off to a scale of 1-16 in. to 1 ft. the distances between the wheels, and the distances center to center of gravity of short lengths of the uniform train load, and draw ordinates through these points. On these ordinates lay off from the line (O M) at the bottom of the sheet the sums of the loads up to and including the load at each ordinate, and draw horizontal lines from these points to the following ordinates. The stepped line thus formed may be designated as the load line.

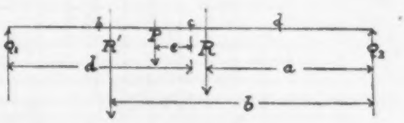
Assume any point M to the right of wheel 1 as the origin of moments, taking this point far enough from wheel 1 to include all the load that will come on the given span. In the accompanying diagram this point is taken at 1.6 ft. from the first wheel.

Multiply the first wheel load by the distance from that wheel to M, and designate the product by M_1. Multiply the second wheel load by the distance from that wheel to M, and designate the product by M_2; and so on for all the other wheels, treating the divisions of the uniform load as wheel loads concentrated at their centers of gravity. Now from M lay off to a scale of 1 in. to 3,000,000 ft. lbs. the ordinates $M1 = M_1$, $M2 = M_1 + M_2$, $M3 = M_1 + M_2 + M$, etc. From the foot of the ordinate at wheel 1 draw the line (1,1) to the top of ordinate M_1; from the point of intersection to this line (1,1) with the ordinate at wheel 2 draw the line (2,2) to the top of the ordinate ($M_1 + M_2$); from the point of intersection of this line (2,2) with the ordinate at wheel 3 draw the line (3,3) to the top of the ordinate ($M_1 + M_2 + M_3$); etc.

Now any ordinate between the line (O M) and the line (1,1) is the moment of wheel 1 about that point; any ordinate between the line (O M) and the line (2,2) is the sum of the moments of wheels 1 and 2 about that point; any ordinate between the line (O M) and the line (3,3) is the sum of the moments of wheels 1, 2 and 3 about that point; etc. Also any ordinate between the lines (1,1) and (2,2) is the moment of wheel 2 about that point; any ordinate between the lines (2,2) and (3,3) is the moment of wheel 3 about that point; etc.

Thus the moment of any wheel, as the *Nth*, about any point to the right is the ordinate at that point between the lines (N—1, N—1) and (N N); and the sum of the moments of the N leading wheels about any point to the right is the ordinate between the lines (O M) and (N N); and the sum of the moments of the N leading wheels, except the first M wheels, about any point to the right is the ordinate between the lines (M M) and (N N.)

It thus appears that this diagram can be used to ascertain the moment of any wheel, or any number of wheels, about any point to the right of the last wheel considered; and that these moments may be read directly from the diagram.



The condition of the maximum moment at any point of a (girder or) simple truss is as follows.

Suppose any series of concentrated loads to be on the truss, and that the maximum moment at c is required. Suppose all the loads on the bridge to have their resultant R at a distance a from the pier q_2: and the loads between q_1 and c to have their resultant R' at a distance b from q_2.

Then $q_1 = \frac{Ra}{l}$, and $M_c = \frac{Ra}{l} d - R'(b - l + d)$.

Now suppose that all the loads are moved a small distance Δx to the left, such that no load comes on or goes off of the span, and no load passes c.

Then $M_c = \frac{R(a + \Delta x)}{l} d - R'(b + \Delta x - l + d)$.

The moment is changed by $\left(\frac{Rd}{l} - R'\right) \Delta x$; and therefore increases when the loading moves to the left, provided $\frac{R}{l} > \frac{R'}{d}$; and increases when the loading moves to the right, provided $\frac{R}{l} < \frac{R'}{d}$.

Now the loading in moving across the span will reach a position such that when some wheel W is on the right of c we shall have $\frac{R}{l} > \frac{R'}{d}$; and when wheel W is on the left of c we shall have $\frac{R}{l} < \frac{R'}{d}$. It therefore follows that when wheel W is at c the value of M_c is a maximum.

To illustrate the application of the diagram in finding the maximum moments in a simple truss, take a span of 54 ft. divided into four panels of 13 ft. 6 ins. each. On a slip of paper mark off the span A B and panel points b, c, d to the same scale as that used in laying off the load spacing, namely 1-16 in. to 1 ft. Suppose the maximum moment at the middle panel point c is required. Place the slip of paper on the diagram, in the position A_1 B_1 with c under wheel 4.

Now a vertical line through B_1 cuts the load line at a distance above the line (O, M) equal to the value of R; therefore, if a fine thread be stretched between this point and the point a, as indicated by the dotted line on the diagram, the thread will have the slope $\frac{R}{l}$.

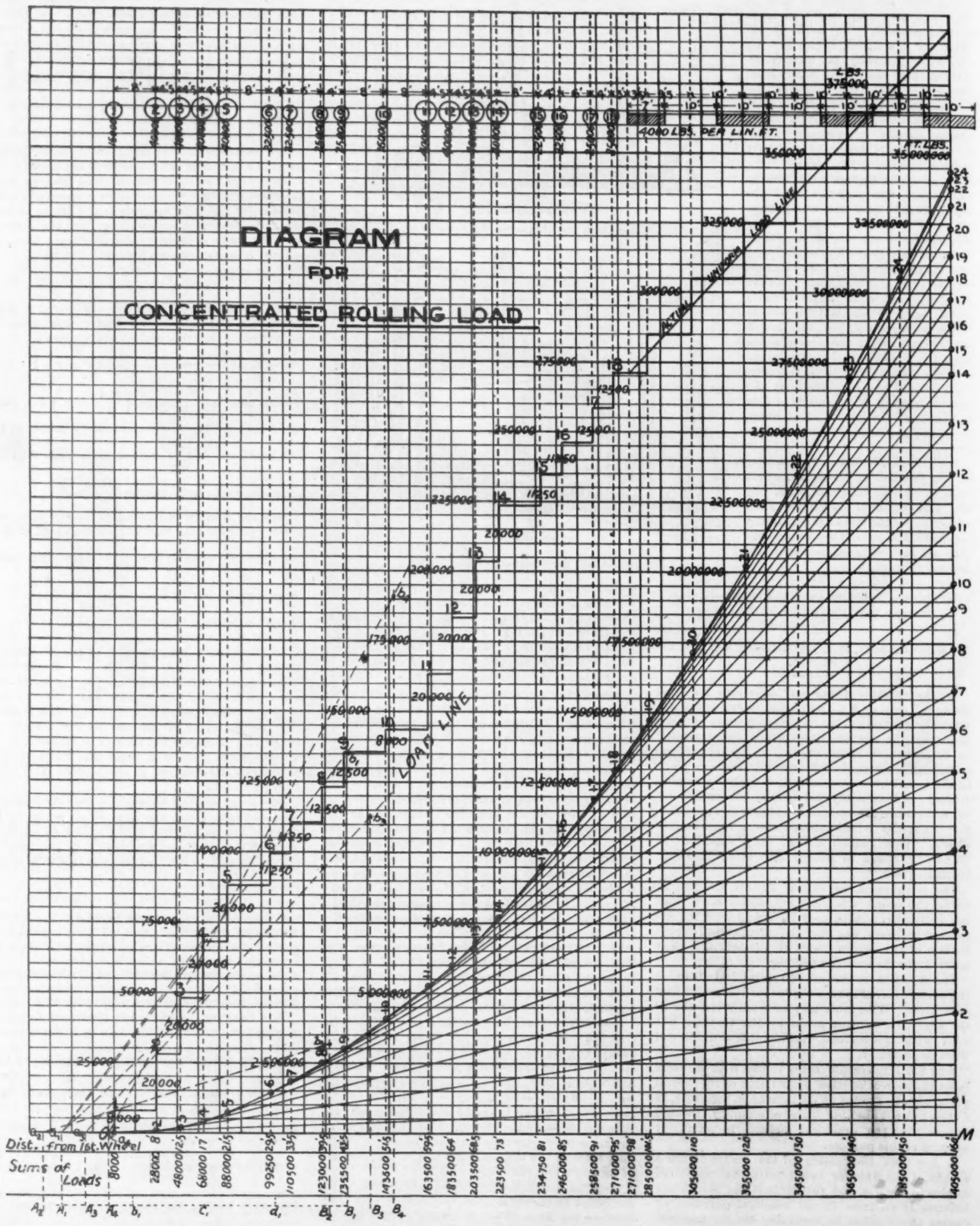
If lines be drawn from the point a to the top and bottom of the part of the load line representing the weight on wheel 4, these lines will have the slope $\frac{R'}{d}$ for the two positions of the loading with wheel 4, just to the left and just to the right of "c."

Now in order for wheel 4 to produce a maximum moment at "c," the condition to be fulfilled is that $\frac{R}{l} - \frac{R'}{d}$ shall change sign as wheel 4 passes from one side to the other of "c," and therefore $\frac{R}{l}$ must lie between the two values of $\frac{R'}{d}$, and hence the thread having the slope $\frac{R}{l}$ must lie between the two lines having the slopes $\frac{R'}{d}$ and must cut the part of the load line representing wheel 4. This,

then, is the manner of finding the position of the loading that will produce a maximum moment at any point of a simple girder or truss: Place the slip of paper A, B, on which the span is marked, with the point c, at which the maximum moment is required, under any assumed wheel, and stretch a fine thread from a to the point of intersection of a vertical through B with the load line. If this thread cuts the part of the load line representing the wheel over c, then the loading produces a maximum moment at c. If the thread passes above this part of the load line, move the loading to the left: if it passes below, move the loading to the right.

It is thus seen that with the use of the load line no arithmetical work is necessary to ascertain the positions of the loading producing maximum moments.

Now for the special case above, the assumed position of the loading with wheel 4 over c produces a maximum moment at c, since the thread crosses the part of the load line representing wheel load 4.



GRAPHICAL METHOD OF CALCULATING BRIDGE STRAINS FOR CONCENTRATED LOADING.

The value of this moment can now be read directly from the moment lines on the diagram, as follows: The sum of the moments about the vertical through B is 3,050,000 ft. lbs.

The sum of the moments about the vertical through c is 410,000 ft. lbs.

The moment at c is, therefore, $\frac{3,050,000}{2} - 410,000 =$ 1,115,000 ft. lbs. The value of this moment found analytically is 1,112,000 ft. lbs. Of course, by increasing the scale, the limit of error can be made as small as desired.

The condition of maximum shear in a simple truss is as follows. Referring to Fig. 1, suppose the maximum shear in the panel $b\,c$ to be required. Let the panel length $b\,c$ be represented by p, and the total load on this panel by P. Let the center of gravity of P be at a distance e from c. Then the shear in panel $b\,c$ is $S_c = R\frac{a}{l} - \sum_{a}^{b} W - \frac{Pe}{p}$. Suppose the loading to now move a small distance $\triangle x$ to the left, so that no load passes on or off of the span and no load passes c or b; then the shear is

$$S + \triangle S = R\frac{a + \triangle x}{l} - \sum_{a}^{b} W - \frac{P(e + \triangle x)}{p}.$$

The value of S is thus changed by $\left(\frac{R}{l} - \frac{P}{p}\right) \triangle x$, and the shear is increased by moving the loading to the left, provided $\frac{R}{l} > \frac{P}{p}$; and is increased by moving the loading to the right, provided $\frac{R}{l} < \frac{P}{p}$. The maximum shear at any panel point occurs in this way: As the train passes over the span, the loading reaches such a position that when a certain wheel is just to the right of the panel point considered, we have $\frac{R}{l} > \frac{P}{p}$; and when this wheel is just to the left of the panel point, we have $\frac{R}{l} < \frac{P}{p}$; and, therefore, the maximum shear at the panel point occurs under this wheel.

Taking the special case of the 54-ft. truss above, the wheel that must be over each panel point to produce a maximum shear is ascertained as follows Place the slip of paper in the position A_1 B_1 on the diagram, so that the wheel 1 is over b_1 and from a_1 stretch a fine thread through the top of the line indicating wheel weight 1. This line then has the slope $\frac{P}{p}$ for the case when wheel 1 stands alone in the panel and cuts the ordinate through B_1 above the value of $W_1 + W_2$. Thus when only wheels 1 and 2 are on the span, the value of $\frac{R}{l} < \frac{P}{p}$, but when more than two wheels are on the span $\frac{R}{l} > \frac{P}{p}$. That is to say, when only two wheels are on the span the first wheel cannot stand in a panel without decreasing the shear in that panel.

Now when the first wheels are on the span, and since $\frac{R}{l} > \frac{P}{p}$ the shear will be increased by moving the load to the left, and the shear under wheel 1 is not a maximum at any point of this truss.

Now place the slip of paper in the position A_2 B_2 on the diagram, so that wheel 2 is over b_2 and from a_2 stretch the thread through the top of that part of the load line representing wheel weight 2. This line then has the slope $\frac{P}{p}$ for the case when wheels 1 and 2 stand alone in the panel, and cuts the ordinate through B above the value of $\sum_{1}^{2} W$. Thus, when some or all of the first seven wheels are on the span, the value of $\frac{R}{l} < \frac{P}{p}$, but when more than 7 wheels are on the span, then $\frac{R}{l} > \frac{P}{p}$. That is to say, when some or all of the first 7 wheels stand on the span, the second wheel, on reaching a panel, cannot enter upon it without diminishing the shear in that panel. Therefore in that part of the span A B extending as far from B as the head of the train, when some or all of the first 7 wheels stand upon the span, the maximum shear occurs at a panel point when wheel 2 stands over it. In the present case, when wheel 2 stands at d, there are 3 wheels on the span; and when wheel 2 stands at c, there are 7 wheels on the span. Therefore, the maximum shear at c and d occurs under wheel 2.

Now place the slip of paper in the position A_3 B_3 on the diagram, so that wheel 3 is over b_3 and from a stretch the thread through the top of that part of the load line indicating wheel weight 3. This line then has the slope $\frac{P}{p}$ for the case when wheels 1, 2 and 3 stand alone in the panel, and cuts the ordinate through B above the value $\sum_{1}^{3} W$. Thus, when some or all of the first 12 wheels, provided the number exceeds 7, are on the span, the value of $\frac{R}{l} < \frac{P}{p}$, but when more than 12 wheels are on the span, then $\frac{R}{l} > \frac{P}{p}$. That is to say, when some or all of the first 12 wheels, provided the number exceeds 7, stand on the span, the third wheel, on reaching a panel, cannot enter upon it without diminishing the shear in that panel. Therefore, in that part of the span $A\,B$ extending as far from B as the head of the train, when some or all of the first 12 wheels, provided the number is greater than 7, stand upon the span, the maximum shear occurs at a panel point when wheel 3 stands over it.

Therefore the maximum shear at b occurs under wheel 3.

It is thus seen that the positions of the load producing the maximum shears in a simple truss can be ascertained without any arithmetical work.

To find the value of the maximum shear at b for the 54-ft. truss, place the slip of paper in the position A_4 B_4 on the diagram, with b under wheel 3. The ordinate at B_4 cuts the moment line at 4,300,000 ft. lbs. The ordinate at wheel 3 cuts the moment line at 190,000 ft. lbs. The shear is therefore

$$\frac{4,300,000}{54} - \frac{190,000}{13.5} = 65,555 \text{ lbs.}$$

The diagram can also be used to ascertain the panel loads as follows: Suppose the panel load at c to be required when wheel 4 is over c. The moment of wheels 2 and 3 about c is the ordinate at c between 1, 1 and 3, 3 and equals 270,000 ft. lbs. by scale. The moment of wheels 5 and 6 about d is the ordinate at d between 4, 4 and 6, 6, and equals 190,000 ft. lbs. by scale.

The panel load at c =

$$\left(40,000 - \frac{270,000}{13.5}\right) + 20,000 + \frac{191,000}{13.5} = 54,150 \text{ lbs.}$$

In the practical use of the diagram it is not necessary to draw any of the lines shown in dotted lines here. A fine thread, held in the hands and stretched on the paper at the various points, gives the needed information more speedily and just as accurately; and the diagram is not defaced.

A scale made of the same kind of paper as that used for the diagram may be advantageously used for reading the values of the moment ordinates, and will be more accurate than a scale made of a different material.

Weather in New York State during August.

The New York State Weather Service Bureau has furnished the following summary of weather conditions during the month of August:

The average atmospheric pressure for the State was 30.07 ins. The highest barometer was 30.40 ins. at Albany, on the 27th, and the lowest was 29.67 ins. at Oswego, on the 14th. The highest temperature reported was 90° on the 21st, at New York City and Geneva, and the lowest was 34°, on the 29th, at Middleburg. The mean temperature for the State, 65.2°; the 21st being the hottest and the 15th the coldest day. The greatest local monthly range of temperature was 54° at Middleburg, and the least was 12.7°, at Setauket. The temperature was generally below the normal, excepting at Buffalo, Humphrey, and Setauket, where it was slightly above. The average precipitation for the State was 2.59 ins. The rainfall was generally below the average excepting at Friendship, where it was 0.82 ins. above; Rondout, 0.15 ins. above; Setauket, 0.70 ins. above; White Plains, 0.11 inches above, and Albany, 0.31 above. The greatest monthly rainfall was 4.74 ins., at White Plains, and the least was 0.64 ins., at Eden Center, Erie County. The prevailing direction of the wind was southwest.

Thunder-storms were reported on the 1st, 2d, 3d, 4th, 9th, 10th, 12th, 15th, 16th, 19th, 20th, 21st, 23d, and 24th. Hail fell on the 2d and 10th. Light frosts were reported at South Canisteo, Steuben County, on the 8th: at Little Valley, Cattaraugus County, on the 11th; at Booneville, Oneida County, on the 10th; at Sherman, Chautauqua County, on the 12th; at Friendship, Allegheny County, and Queensbury, Warren County, on the 27th, and at South Kortright, Delaware County, on the 29th.

The weather predictions for the month were verified as follows: For weather, 87.5 per cent. were fulfilled; for temperature 89.8 per cent.; for weather and temperature combined, 88.1 per cent. The data for this summary have been obtained from the records of 41 volunteer observers, 6 signal service stations, and 28 display stations, reporting this month to the New York Central Office, Cornell University.

The Liverpool (England) Water-Works Scheme.

Hydraulic Engineer DEACON, of the Liverpool Corporation, in his report dated Sept. 10, states that all the discharge valves in the great masonry dam (Vyrnwy) were closed on the 28th of last November and the water allowed to rise. The statutory compensation of water has been regularly given to the Vyrnwy stream, which is intercepted by the dam, and although the rainfall from that time to the end of August has been about 14 per cent. below the average, the contents of the lakes now formed amounted to 10,503,000,000 galls., with a surface area of 1,051 acres at an elevation of 9 ft. below the overflow of the dam. The contents of the lake or reservoir at overflowing point will be 14,125,000,000 galls. with a surface area of 1,121 acres.

During the rise of the water most accurate and precise observations have been taken in order to note the "behavior" of the dam under the gradually increasing pressure. The deflection proved to be less than was calculated from the compressional resistance of the different materials composing the dam, which had been ascertained by experiment, and it was also much less than one would be led to expect from the analogy of observations which had been made upon the resistance of other masonry dams.

The under drainage from the foundations was insignificant and a small fraction only of the amount anticipated from experience of other undertakings of a similar kind.

The total amount of money required to complete the whole of the works in connection with this scheme for a supply of 13,000,000 galls. a day to the city of Liverpool, is estimated at $440,000.

The probable total cost of the whole scheme completed, including works, purchase of land, law charges, etc., will have been about $10,200,000.

We are indebted to Mr. ALFRED PALMER, 11 Imperial Building, Dale St., Liverpool, for the above.

THE LARGE RESERVOIR AT NASHVILLE, TENN., described and illustrated in our issue of June 16, 1888, has been recently completed. It is nearly elliptical in form, with a major axis of 606, and a minor axis of 463.4 ft. There are two basins, each with a capacity of 25,000,000 galls.

The following is the itemized cost of the reservoir, not including land or professional services.

Clearing site	$ 100
Excavation 173,920.4 cu. yds	121,744
Rubble masonry, 41,078.184 cu. yds	160,205
First-class masonry, 1,765.4 cu. yds.	19,597
Concrete, 13,087.554 cu. yds.	50,407
Hauling pipes, etc., 211,945 lbs	106
Brick fence around top, 1,774.84 lin. ft.	3,142
Wrought-iron fence, 1,725.761 lin. ft.	1,293
Wrought-iron curbing to wells, 15,000 lbs.	750
Steps complete	1,378
Total	$364,525

The reservoir was under construction for two years. Mr. J. A. JOWETT was Chief Engineer, Mr. H. P. B. RIGBY, Assistant Engineer, and Messrs Whitsit & Adams, Contractors.

Statistics of Railway Construction.

SOUTHWESTERN STATES.

(Accompanying Map No. 19 of the Progress and Prospects of Construction.)

MISSOURI.—Existing Roads.

1. ***Cape Girardeau & Southwestern.***—Track laid in 1888, Wappapello to Williamsville, 20 miles. Track laid in 1889, Williamsville to Hunter, 22 miles. Projected, Cape Girardeau to Perryville, 35 miles.

2. ***Chicago, Kansas City & Texas.***—Track laid in 1889, Kansas City to Linden, 9 miles; Kansas City to Fair Grounds 1.6 miles. Under construction, Linden to Smithville, 13 miles. Under survey, Smithville to Edgerton, 10 miles. President, W. E. Winner; Chief Engineer, Jas. R. Chapman; both of Kansas City.

3. ***Chicago St. Paul & Kansas City.***—Track laid in 1888, 3 miles south of Rea to St. Joseph, 19.1 miles.

4. ***Cleveland, St. Louis & Kansas City.***—Track laid in 1889, end of track to Hamburg, 6 miles. Graded, St. Charles to Alton, 20 miles; Hamburg to Pinkney, 35 miles. Projected, Pinkney to Boonville, 100 miles. Chief Engineer, J. T. K. Hayward, 518 Ree Building, St. Louis, Mo.

5. ***Greenfield & Northern.***—Under construction, Greenfield to Stockton, 22 miles. President, L. W. Shafer, Greenfield.

6. ***Kansas City & Southern.***—Track laid in 1888, Kansas City to East Lynne, 47.04 miles. Track laid in 1889, end of track to Clinton, 1 mile; North Clinton to Clinton, 2 miles; Osceola to Marshville, 1 mile. Projected, Osceola to Bolivar, 49 miles.

7. ***Kansas City, Fort Scott & Memphis.***—Track laid in 1888, Birch Tree to Grandin, 53 miles.

8. ***Kansas City, Fort Smith & Southern.***—Track laid in 1888, Joplin to 2 miles south of Neosho, 22.7 miles. Track laid in 1889, 2 miles south of Neosho to Sulphur Springs, 33.3 miles. Surveyed, Sulphur Springs to Fort Smith, Ark., 80 miles. President, L. L. Bush; Chief Engineer, S. R. Patterson; both of Neosho.

9. ***Kansas City, Rich Hill & Southern.***—Surveyed, Kansas City to Rich Hill, 80 miles. President, S. F. Scott, 127 West Sixth St., Kansas City; Chief Engineer, J. W. Heviman, Kansas City.

10. ***Mississippi River & Bonne Terre.***—Track laid in 1888, Big River to Zalle, 5.2 miles. Track laid in 1889, Zalle toward Crystal City, 10 miles. Graded, end of track to Crystal City, 7 miles. Chief Engineer, J. H Serviss, Bonne Terre.

11. ***Missouri Pacific.***—Track laid in 1888, between Boonville and Lexington, 52 miles. Projected, Bagnell to Lebanon, 45 miles.

12. ***St. Louis & San Francisco.***—Projected, Salem to West Plains, 75 miles.

13. ***St. Louis, Arkansas & Texas.***—Track laid in 1888 Malden to Delta, 51.37 miles.

Projects and Surveys.

Central Belt Line.—Located, Macon to Bevier, 5.25 miles. President, J. A. Hudson, Chief Engineer, C. J. DuBois; both of Macon.

14. ***Kansas City & Excelsior Springs.***—Surveyed, Missouri City to Excelsior Springs, 8 miles. Hammett, Davison & Co., Kansas City.

Kansas City Circle.—Projected, belt line around Kansas City, 25 miles. President, E. T. Rogers; Chief Engineer, Wm. B. Knight; both of Kansas City.

15. ***Kansas City, Independence & Lee's Summit.***—Surveyed, Kansas City to Lee's Summit, 17.5 miles. President, J. W. Mercer; Chief Engineer, Wm. B. Knight; both of Kansas City.

16. ***Kansas City, Monett & Southern.***—Projected, Monett to Rosedale, 171 miles. President, B. F. Hobart; Chief Engineer, F. W. Bond; both of St. Louis, Mo.

Kansas City Suburban Belt.—Surveyed, in and about Kansas City, 20 miles. President, E. L. Martin; Chief Engineer, J. W. Heyman; both of Kansas City.

Kingston & Polo Short Line.—Projected, Kingston to Polo, 7 miles. President, C. W. M. Love, Chief Engineer, Johnson Boyd; both of Kingston.

17. ***Reed Springs & Kansas City.***—Projected, Liberty to Birmingham, 4 miles. President, Geo. I. Reed; Chief Engineer, Gustave Dyer; both of Liberty.

St. Joseph Belt.—Projected, belt line at St. Joseph, 9 miles. J. E. McColgin, St. Joseph.

18. ***St. Louis & Northwestern.***—Projected, St. Louis to Omaha, Neb., 500 miles. President, S. M. Pickler; Chief Engineer, E. M. Collins; both of Kirksville.

Total.—Track laid in 1888, 270.4 miles. Track laid in 1889, 86 miles. In process of construction, 97 miles. Under survey, 199 miles. Projects of some promise, 810 miles.

KANSAS.—Existing Roads.

19. ***Atchison, Topeka & Santa Fé.***—Track laid in 1888, Southern Kansas R. R. to Pittsburg, 2.8 miles; Concordia to Nebraska State line, 37.6 miles.

20. ***Burlington & Missouri River.***—Track laid in 1888, Blakeman to St. Francis, 38.74 miles.

21. ***Chicago, Rock Island & Pacific.***—Chicago, Kansas & Nebraska.—Track laid in 1888, Norton to Kanorado, 123.6 miles; Kingsdown to Liberal, 79.2 miles.

22. ***Dodge City, Montezuma & Trinidad.***—Track laid in 1888, Dodge City to Montezuma, 28 miles. Projected, Montezuma to Trinidad, Col., 217 miles. President, A. T. Soule, Rochester, N. Y.; Secretary, G. M. Hoover Dodge City.

23. ***Kansas City & Pacific.***—Track laid in 1888, Selma to Paola, 32 miles.

24. ***Kansas City, Wyandotte & Northwestern.***—Track laid in 1888, Leavenworth to Ft. Leavenworth, 2 miles; Seneca to Nebraska State line, 23 miles. Track laid in 1889, Axtel to Summerfield, 12 miles. Under construction, Summerfield to Beatrice, Neb., 35 miles. Under survey, Carbondale to Wichita, 125 miles.

25. ***Marion Belt & Chingawassa Springs.***—Track laid in 1889, Marion to Chingawassa Springs, 8 miles. President, John Hall, Fort Ann, N. Y., Chief Engineer, O. C. Le Suer, Marion.

11. ***Missouri Pacific.***—Under survey, Fort Scott to Rich Hill, Mo., 30 miles.

26. ***Omaha, Hutchinson & Gulf.***—Track laid in 1889, Hutchinson to Kingman, 30 miles.

12. ***St. Louis & San Francisco.***—Track laid in 1888, Bluff to Anthony, 10.54 miles.

27. ***Union Pacific.***—Lincoln, Colorado & Western.—Track laid in 1888, Waldo to Colby, 130.9 miles.

Projects and Surveys.

28. ***Chicago, Kansas & Arkansas.***—Located, St. Joseph to Neosho, 225 miles. President, Joseph Hansen, St. Joseph. Secretary, W. G. Seaver, 1,019 Mitchell Ave., St. Joseph.

Guyandotte & Quindaro.—Surveyed, Chelsea Park to Quindaro, 2.5 miles. President, Jas. Green, Lawrence; Chief Engineer, S. J. Hatch.

29. ***Kansas City, Lawrence & Nebraska.***—Protected, Lawrence to Grand Island, Neb., 375 miles. President, W. H. Chick; Engineers, Breithaupt & Allen, Kansas City.

30. ***Omaha, Dodge City & Southwestern.***—Surveyed, Dodge City to Superior, 206 miles.—Harold, Garden City & Southwestern.—Projected, Harold to Garden City, 55 miles. President, G. M. Hoover; Chief Engineer, C. E. Gallagher; both of Dodge City.

Total.—Track laid in 1888, 508 miles. Track laid in 1889, 50 miles. Under survey, 527 miles. Projects of some promise, 407 miles.

INDIAN TERRITORY.—Existing Roads.

21. ***Chicago, Rock Island & Pacific.***—Track laid in 1888, Caldwell to Pond creek, 21 miles. Track laid in 1889, Pond creek to Skeleton, 21 miles. Under construction, Skeleton to Kingfisher, 44 miles. Projected, Kingfisher to Cisco, Tex., 200 miles.

11. ***Missouri Pacific.***—Track laid in 1888, Van Buren, Ark. to Wagoner, 84 miles. Track laid in 1889, Coffeyville, Kan., south, 28.5 miles; Wagoner to Verdigris river, 34.8. Under construction, between ends of track, 18.2 miles.

Total.—Track laid in 1888, 105 miles. Track laid in 1889, 95 miles. In process of construction, 117 miles. Projects of some promise, 280 miles.

ARKANSAS.—Existing Roads.

31. ***Arkansas Midland.***—Projected, Clarendon to Little Rock, 40 miles.

32. ***Batesville & Brinkley.***—Augusta & Southeastern.—Track laid in 1888, Coats to Watkins, 3 miles. Track laid in 1889, Watkins to Lone Grove, 3 miles. Projected, Lone Grove to Augusta, 9.5 miles;—White & Black River Valley R. R.—Jacksonport to Missouri State Line, 75 miles.

33. ***Eureka Springs.***—Projected, Eureka Springs to Harrison, 49.5 miles.

34. ***Fort Smith, Paris & Dardanelle.***—Track laid in 1888, Fort Smith to end of track, 5 miles. Projected, end of track to Dardanelle, 75 miles.

35. ***Houston, Central Arkansas & Northern.***—Track laid in 1889, Monroe, La., to Columbia, La., 20 miles. Under construction, Monroe, La., to Bastrop, La., 30 miles. Surveyed, Bastrop, La., to Pine Bluff, Ark., 100 miles. Columbia, La., to Alexandria, La., 60 miles. Projected, Alexandria, La., to Houston, Tex., 140 miles.

36. ***Louisiana, Arkansas & Missouri.***—Under construction, Delhi, La., to Trippe, Ark., 80 miles. Projected, Trippe to Brinkley, 90 miles; Delhi, La., to Alexandria, La., 110 miles. President, Harlow M. Hoyt, 58 William St., New York, Chief Engineer, W. E. Agnew, Youngstown, Ohio.

Louisville, New Orleans & Texas.—Under construction, transfer at Helena, 9 miles.

11. ***Missouri Pacific.***—Track laid in 1888, Fort Smith to Greenwood, 17.63 miles.

13. ***St. Louis, Arkansas & Texas.***—Track laid in 1888, Canfield to Louisiana State line, 7 miles; Altheimer to Argenta, 46.8 miles.

37. ***Stuttgart & Arkansas Post.***—Under construction, Stuttgart to Pendleton, 45 miles. Under survey Hazen to Stuttgart, 25 miles.

38. ***Texarkana Northern.***—Under construction, Red River north 15 miles. Projected, end of grade to Fort Smith, 130 miles. Chief Engineer, J. E. Dougherty, Texarkana, Tex.

Projects and Surveys.

39. ***Arkansas & Gulf.***—Under survey, Arkansas City to Pendleton, 35 miles. President, W. R. Bergholz, 15 Cortlandt St., New York. Auditor, Wm. Bonner, Arkansas City.

40. ***Camden & Alexandria.***—Projected, Camden to Alexandria, La., 175 miles. President, C. C. Henderson, Chief Engineer, N. R. Smith; both of Camden.

41. ***Central Arkansas.***—Projected, Swan Lake to Helena, 65 miles. President, A. C. Barstow, New York. Chief Engineer, H. J. Campbell.

42. ***Hackett City, Greenwood & Eastern.***—Surveyed, Hackett City east to coal fields, 25 miles. President, Robert H. McConnell, Chief Engineer, Jas. E. Johnson; both of Greenwood.

43. ***Memphis, Little Rock & Indian Territory.***—Projected, Little Rock to Indian Territory State line, 144 miles. Chief Engineer, H. A. Schwanecke, Little Rock.

44. ***Mississippi Valley.***—Projected, Arkansas City to West Baton Rouge, La., 266 miles. President, Hiram R. Steele, Natchez, Miss. President of Construction Co., C. H. Plummer, East Saginaw, Mich.

45. ***Paris, Choctaw & Little Rock.***—Projected, Paris, Tex., to Little Rock, Ark., 210 miles. President, S. J. Wright, Paris, Tex.

Total.—Track laid in 1888, 73.4 miles; Track laid in 1889, 3 miles. In process of construction, 111 miles. Under survey, 225 miles. Projects of some promise, 1,121 miles.

LOUISIANA.—Existing Roads.

46. ***East Louisiana.***—Track laid in 1888, Abita to Covington, 4 miles. Projected, Covington to Franklin, 30 miles.

47. ***Kansas City, Watkins & Gulf.***—Under construction, Lake Charles north 50 miles. Projected, end of track to Shreveport, 120 miles. President, J. B. Watkins; Chief Engineer, P. H. Philbrick; both of Lake Charles.

48. ***Louisville, New Orleans & Texas.***—Track laid in 1889, Slaughter to Bayou Sara, 15 miles.

49. ***Louisiana, North & South.***—Under contract, Gibsland south 8 miles. Projected, end of track to Alexandria, 80 miles; Homer to Hope, Ark., 60 miles.

50. ***Natchitoches.***—Projected, Natchitoches to Red River, 15 miles.

New Orleans, Fort Jackson & Grand Isle.—Under construction, Algiers to Fort Jackson, 65.5 miles; 30 miles graded, President, H. C. Warmoth, 35 Carondelet St., New Orleans.

51. ***New Orleans, Natchez & Fort Scott.***—Under construction, Natchez to Rayville, 75 miles. Projected, Rayville to Hot Springs, Ark, 160 miles. Chief Engineer, W. Dunbar Jenkins, Natchez, Miss.

13. ***St. Louis, Arkansas & Texas.***—Track laid in 1888, Arkansas State line to Shreveport, 40 miles.

Texas & Pacific.—Track laid in 1889, Piaquemine to Indian Village, 9 miles.

Projects and Surveys.

52. ***Arcadia, Alexandria & Fort Smith.***—Projected, Arcadia to Alexandria, 100 miles. President, A. L. Atkins, Arcadia.

53. ***Union & Northwestern.***—Under survey, Monroe to Farmersville, 22 miles. Projected, Farmersville to Camden, Ark., 65 miles. President, Uriah Milsaps, West Monroe.

Total.—Track laid in 1888, 44 miles. Track laid in 1889, 44 miles. In process of construction, 267 miles. Under survey, 102 miles. Projects of some promise, 1,036 miles.

TEXAS.—Existing Roads.

19. ***Atchison, Topeka & Santa Fé.***—Track laid in 1888, end of track to Panhandle City, 4.5 miles.—Gulf, Colorado & Santa Fé.—Ballinger to San Angelo, 35 miles.

Austin & Northwestern.—Track laid in 1889, Burnet to Marble Falls, 16 miles. Projected, Marble Falls to Llano, 15 miles.

54. ***Dallas, Pacific & Southeastern.***—Under contract, Dallas to Graham, 110 miles. Projected, Graham to Albuquerque, N. M., 390 miles.

55. ***Denison & Washita Valley.***—Track laid in 1889, from a point 3 miles south of Lehigh, Ind. Ter., to a point 7 miles north, 10 miles. Under construction, end of track to Denison, Tex., 55 miles. Projected, end of track to Fort Smith, Ark., 125 miles.

56. ***Denison, Bonham & New Orleans.***—Partly graded, Denison to Bonham, 45 miles. President, R. B. Allen, Bonham; Chief Engineer, Fred P. James, Denison.

Denison Rapid Transit.—Under construction, at Denison, 6.5 miles. Engineers, Filley & Co., Kansas City, Mo.

57. ***Fort Worth & Denver City.***—Track laid in 1888, Washburn to Panhandle City, 16 miles.

58. ***Fort Worth & Rio Grande.***—Track laid in 1889, Granbury south, 20 miles. Under construction, end of track to Dublin, 30 miles. Under survey, Dublin to Comanche, 22 miles. Contractors, Hurley, Tierney & Lynch, Fort Worth. Chief Engineer, E. Miller, Granbury.

Kansas City, El Paso & Mexican.—Track laid in 1888, El Paso to Lanoria, 10 miles.

59. ***Kildare & Linden.***—Track laid in 1888, Kildare to Linden, 14 miles.

60. ***Missouri, Kansas & Texas.***—Track laid in 1888, Dallas to Lancaster, 16 miles.

61. ***Paris, Marshall & Sabine Pass.***—Under construction, Starr's to Paris, 100 miles.

62. ***Red River, Sabine & Western.***—Under construction, San Augustine to Nacogdoches, 40 miles. Under contract, Palestine to Nacogdoches, 70 miles. Projected, Palestine to Fort Worth, 130 miles; San Augustine to Alexandria, La., 105 miles. President Lt. W. Lloyd, Chief Engineer; J. C. Tarry, both of Nacogdoches.

Rio Grande & Eagle Pass.—Projected, Santa Tomas toward Eagle Pass, 25 miles.

13. ***St. Louis, Arkansas & Texas.***—Track laid in 1888, Remer to Fort Worth, 41 miles.

63. ***San Antonio & Aransas Pass.***—Track laid in 1888, Gregory to Rockport, 20 miles; Skidmore to Kleburg, 43 miles; Houston west, 35 miles. Track laid in 1889, Brazos river east, 10 miles; Shiner to Luling, 39.5 miles. Under construction, Luling to Lockhart, 16 miles; Guadalayuse to Llano, 74 miles; West Point to Waco, 120 miles. Under survey, Kennedy to Laredo, 150 miles.

Southern Pacific.—Track laid in 1889, Victoria to Beeville, 55 miles.

64. ***Texas & Pacific.***—Track laid in 1888, Gordon to Gordon Mines, 3 miles.

65. ***Texas, Sabine Valley & Northwestern.***—Track laid in 1888, Mineral Springs to Carthage, 14 miles.

Projects and Surveys.

Brazos Terminal.—Surveyed, Velasco to Arcola, 40 miles. President, Wm. D. Lee, Leavenworth, Kan.

66. ***Cattle Trail.***—Surveyed, Red River to Brady, 240 miles, Projected, Brady to Eagle Pass, 225 miles. Chief Engineer, Stanly M. Jones, Baird.

Houston Belt & Magnolia Park.—Under survey, Houston to Port Houston, 4 miles. W. D. Cleveland, Houston.

67. ***Lampasas, Burnet & Southwestern.***—Surveyed, Lampasas to Burnet, 23 miles. Chief Engineer, H. L. Higdon, Lampasas.

68. ***Sulphur Springs & Red River.***—Projected Sulphur Springs to Red River, 60 miles. Geo. B. Boomer, Sulphur Springs.

69. ***Texas Midland.***—Projected, Waco to Shreveport, La., 243 miles. President, W. A. Taylor; Chief Engineer, Stephen Turner; both of Waco.

70. ***Weatherford, Mineral Wells & Northwestern.***—Projected, Weatherford to Mineral Wells, 30 miles.

Total.—Track laid in 1888, 251.5 miles. Track laid in 1889, 141 miles. In process of construction, 611 miles. Under survey, 479 miles. Projects of some promise, 1,190 miles.

(The following lists include only lines partly or wholly within the limits of the map.)

ILLINOIS.—Existing Roads.

Alton Terminal.—Track laid in 1889, in Alton City, 1 mile.

71. ***Centralia & Chester.***—Track laid in 1889, Sparta to Coulterville, 8 miles. Under construction, Coulterville to Centralia, 38 miles. Surveyed, Sparta to Ste. Genevieve, 22 miles. Projected, Centralia to Altamont, 40 miles. President, T. B. Needles; Treasurer and General Manager, J. M. McCutcheon; both of Sparta.

72. ***Grand Tower & East Cape Girardeau.***—Under construction, Grand Tower to Cape Girardeau, 28 miles. President, E. A. Hitchcock, St. Louis, Mo.; Secretary, J. D. Peters, Murphysboro, Ill.; Chief Engineer, P. R. Van Frank, Cape Girardeau, Mo.

73. ***Indiana & Illinois Southern.***—Projected, 1 mile west of Newton to East St. Louis, 115 miles.

74. ***Kaskaskia, St. Elmo & Southern.***—Located, Altamont to Metropolis, 158 miles. President, B. F. Johnston, St. Elmo; Chief Engineer, James M. Brown.

75. ***Louisville, Evansville & St. Louis.***—Under construction, Belleville to Mt. Vernon, 67 miles.

76. ***St. Louis, Alton & Terre Haute.***—Track laid in 1888, Parker City to Brooklyn, 38 miles.

77. ***St. Louis & Chicago.***—Track laid in 1889, between Mt. Olive and Alhambra, 8 miles. Under construction, 6 miles.

Projects and Surveys.

78. ***Belleville & St. Louis.***—Located, Belleville to East St. Louis, 8 miles. President, John S. Hill, East St. Louis; Chief Engineer, Louis Graner, Belleville.

79. ***Cairo & Northwestern.***—Surveyed, Cairo to East Cape Girardeau, 40 miles. President, Chas. O. Patier, Cairo; Chief Engineer, Geo. W. Morse; Secretary, H. Wells, Cairo.

80. ***Chicago & New Orleans.***—Projected, Shumway to Paducah, 152 miles. President, Geo. A. Sanders, Chief Engineer, Chas. Hansel; both of Springfield.

81. ***Peoria, Springfield & St. Louis.***—Projected, Springfield to East St. Louis, 87 miles. President, W. S. Hook, Jacksonville.

82. ***Springfield & Southern Illinois.***—Projected, Springfield to Pinckneyville, 125 miles. President, Rufus

N. Ramsay, Carlyle, Ill.; Secretary, Amos Miller, Hillsboro, Ill.

KENTUCKY.—Existing Roads.

83. *Ohio Valley.*—Track laid in 1889, Henderson to Evansville, 14.6 miles. Surveyed, Princeton to Hopkinsville, 30 miles.

TENNESSEE.—Existing Roads.

84. *Missouri, Tennessee & Georgia.*—Under survey, Hickman, Ky., to Humboldt, Tenn., 85 miles. President, L. B. Wright, Humboldt; Chief Engineer, J. J. Williams, Jackson.

85. *Gulf & Ship Island.*— Projected, Middleton to Jackson, 40 miles.

86. *Paducah Tennessee & Alabama.*—Under construction, Paducah, Ky., to Paris, 75 miles. Projected, Paris to Florence, Ala., 125 miles. Contractors, McIntire & Concannon, Paducah; J. H. Concannon, 45 Broadway, New York.

87. *Tennessee Midland.*—Track laid in 1888, between Memphis and Jackson, 70 miles. Track laid in 1889, between Jackson and Tennessee river, 50 miles. Located, Tennessee river to Nashville, 93 miles. Surveyed, Nashville to Virginia State line 210 miles.

Projects and Surveys.

88. *Birmingham, Jackson & Kansas City.*—Projected, Jackson to Tiptonville, 75 miles.

MISSISSIPPI.—Existing Roads.

48. *Louisville, New Orleans & Texas.*—Track laid in 1888, Lamont to Rosedale, 25.5 miles. Track laid in 1889, between Rosedale and Coahoma, 18 miles; Rolling Fork to Hampton, 10.5. Under construction, between Rosedale and Coahoma, 32 miles. Surveyed, Centerville to Woodville, 15 miles.

89. *Georgia Pacific.*—Track laid in 1888, Columbus to West Point, 19 miles; Johnsonville toward Greenville, 6 miles. Track laid in 1889, West Point to 6 miles east of Greenwood, 130 miles.

85. *Gulf & Ship Island.*—Track laid in 1888, Little Biloxi river to 1 mile north of Big Biloxi river, 8 miles; Cherry Creek to Pontotoc, 8 miles. Under construction, end of track to Hattiesburg, 54 miles. Surveyed, Hattiesburg to Carthage, 100 miles. Projected, Carthage to Pontotoc, 115 miles.

90. *Kansas City, Memphis & Birmingham.*—Projected, Aberdeen to Columbus, 27 miles.

91. *Natchez, Jackson & Columbus.*— Projected, Jackson to Columbus, 120 miles.

92. *Warrior Coal Fields.*— Projected, Meridian, Miss., to Gainesville, Ala., 56 miles. Chief Engineer, J. W. Gallup, Meridian.

Projects and Surveys.

93. *Helena, Tupelo & Decatur.*—Projected, Glendale to Tupelo, 110 miles. President, J. L. Finlay, Tupelo, Sec., Harvey C. Medford, Tupelo.

94. *Memphis & Atlantic.*— Projected, Memphis, Tenn., to Tuscaloosa, Ala., 200 miles. President, F. M. Abbott, Abbott, Miss.

95. *Meridian & Tuscahoma.*—Surveyed, Meridian to Tuscahoma, 45 miles. President, W. H. Hardy, Meridian; Chief Engineer, Maj Weeks, Meridian.

Meridian Belt.—Projected, belt line at Meridian, 12 miles. Chief Engineer, J. M. T. Hamilton, Meridian.

96. *Mississippi River & Mexican Gulf.*—Projected, Natchez, Miss., to Mobile, Ala., 230 miles; President, J. B. Richardson, Wesson.

97. *Mobile, Jackson & Kansas City.*—Located, Mobile, Ala., to Jackson, Miss., 175 miles; President, F. A. Luling, Mobile, Ala.; Chief Engineer, T. W. Nicol, Mobile, Ala.

98. *Waynesboro, Pascagoula & Gulf Coast.*—Surveyed, Waynesboro to Gulf of Mexico, 107 miles; President, J. R. S. Pitts, Waynesboro, Miss.; Chief Engineer, P. S. Layton.

PERSONAL.

Mr. JAMES G. DAGRON has been appointed Engineer of Bridges of the Baltimore & Ohio Railroad.

Col. J. H. MORLEY, C. E., the original engineer and the first superintendent of the Iron Mountain railway, died at Windsor, N. Y., Sept. 12.

Mr. ROBERT LAUGHLIN, Superintendent of the Saginaw, Tuscola & Huron Ry., has resigned.

Mr. JOHN C. MEAD, architect, of Hartford, Conn., died Sept. 17.

Mr. E. L. BENNETT, Superintendent for Andrews & Warner, the contractors for the Pennsylvania, Poughkeepsie & Boston Ry., was run over and killed last week by a construction train.

Mr. FRANK VAN VLECK has been appointed Chief Engineer of the San Diego Cable Car Co. He has for the past year been mechanical engineer of the Los Angeles Cable Railroad Co., and was formerly Professor of Mechanical Engineering at Cornell University.

Mr. CHARLES F. KERCHNER has been appointed Superintendent, and Mr. SAMUEL M. MANIFOLD has been appointed Roadmaster of the York & Peach Bottom R. R., which has been leased by the Maryland Central Ry. Co., of which Mr. SAMUEL REA is Vice-President.

The position of General Superintendent of the Fort Wayne, Louisville & Cincinnati, recently filled by Mr. W. W. WORTHINGTON, has been abolished and the duties of the office will hereafter be shared between Mr. GEORGE W. SAUL, General Manager, and the Master of Transportation.

Gen. Supt. ALLEN, of the Chicago, Rock Island & Pacific Ry., Kansas Division, has announced the following appointments: Mr. CHAS. DUNLAP is appointed Asst. Gen. Superintendent, with headquarters at Topeka Kan.; Mr. W. H. STILLWELL is appointed Superintendent of the Eastern Division, with headquarters at Horton, Kan., vice Mr. CHAS. DUNLAP, promoted; Mr. C. H. HUBBELL is appointed Superintendent of the Southeastern Division, with headquarters at Herington, Kan.

Mr. CLAUDE VICTOR QUILLIARD, an old resident of Rondout, N. Y., died at Duluth, Minn., Sept. 17. He was a civil engineer and architect by profession, and a graduate of Columbia College. After he took up the study of civil engineering he was for a time in the employ of the Erie railroad. He pursued engineering and architecture in Rondout, and drew the designs for several of its churches and public buildings.

Mr. A. E. TOUZALIN, President of the Chicago, Burlington & Northern Ry. Co., whose death we recorded last week, was of English birth, and entered the railway service in 1865 as clerk in the freight office of the Lake Shore road. From 1866 to 1869 he was chief clerk in the general offices of the Des Moines Valley road; from 1869 to 1873, general passenger agent of the Burlington & Missouri River road; in 1873 he became general passenger agent and land commissioner of the Santa Fé road, but in 1874 left the Santa Fé and occupied the same position for Burlington roads till 1878; from 1878 to 1882 he was General Manager of the Burlington & Missouri River road, and during the next year was first Vice-President of the Chicago, Burlington & Quincy road; in 1883, when Mr. W. B. STRONG was very sick, Mr. TOUZALIN was called to the Santa Fé as Vice-President and General Manager. He occupied this position till 1885, when he retired from the Santa Fé, and has since been President of the Chicago, Burlington & Northern, which was built under his supervision.

Dr. GEORGE H. COOK, State Geologist of New Jersey and Vice-President of Rutgers College, died suddenly Sept. 21 of heart failure. His splendid work on the State Survey of New Jersey entitles him to the grateful remembrance of engineers. A native of Hanover, N. J., he became in 1836 a civil engineer, and almost his first work was to lay out the line for the Catskill & Canajoharie Railroad. He entered the Troy Polytechnic Institute, and was graduated in 1839. He then became a teacher in the institute, and in 1843 was made senior professor. He afterwards became Professor of Mathematics and Natural Philosophy in the Albany Academy. In 1850 he became Principal of the academy, and held the office two years, leaving on his election to the Chair of Chemistry and Natural Philosophy in Rutgers College. The next year he was made Assistant Geologist of New Jersey.

The office of State Geologist had been allowed to lapse for several years, but a paper by Dr. COOK led to its reorganization, and in 1864 he was made its head. His work as State Geologist has been varied and of great importance. The topographical maps of the State which have been published under his supervision are by far the best which exist of any State, and are not surpassed in excellence by any in the world. The last of the series was recently issued, and Dr. COOK was at the time of his death engaged on his final report. Two volumes had been prepared, the latter now being in print.

Dr. COOK's active and useful life was filled with many other public labors, too numerous to mention. He was a most unostentatious man, very plain in address, but a persistent worker and an indefatigable collector, as the State Museum at Rutgers bears witness. He was seventy-two years of age and leaves a widow and two children, as well as the whole intelligent public, to mourn his loss.

PUBLICATIONS RECEIVED.

—Journal of the Association of Engineering Societies. September, 1889. Price 50 cts.

This number of the Journal contains a paper on "The High-Service System of the Boston Water-Works," by J. A. GOULD, Jr.; and another on "The Foundations of the Limfjord Bridge," by O. SONNE.

—Association of Dominion Land Surveyors.—Report of Proceedings at the Sixth Annual Meeting, held at Ottawa, Feb. 19, 20, and 21, 1889. Paper, 208 pp. Price 50 cts. Copies may be obtained of A. O. WHEELER, Secretary-Treasurer of the Association, at Ottawa.

This volume contains the constitution and by-laws, minutes of proceedings, list of members, reports of officers and committees, lectures, a number of interesting papers, and other matter. The papers are as follows: "Occultations of Stars by the Moon." W. F. KING; "Practical Prospecting for Gold and Silver, and the Preliminary Development of Metalliferous Veins," J. BRADY; "Reflection of the Electric Light," O. J. KLOTZ; "Gunter's Chain," S. BRAY: "The Status of Our Profession," J. W. HARRIS: "A Standard of Precision," J. A. KIRK: "Coal Mining," C. A. MAGRATH; "A New Form of Field Book," A. J. BRABAZON: "A Plea for Pioneers," Dr. R. BELL; "Hon. D. W. SMITH, First Surveyor-General of Upper Canada," J. MCARRE; "Azimuth by Means of Two Stars," S. L. BRABAZON; "Photo-topography in Italy," "Irrigation," THOS. FAWCETT; "Suggestions for Surveyors' Reports," A. T. DRUMMOND; "Settlement and Irrigation," W. PEARCE; "Dominion Government Surveys in Manitoba, the Northwest Territories, and British Columbia," J. S. DENNIS; "Distance Measuring Micrometers," W. F. KING; "Geographical Nomenclature" A. T. DRUMMOND; "Surveys of the Province of Quebec," G. E. MCMARTIN.

The committee reports are on "Geodetic Surveying," "Land Surveying," "Natural History and Geology," "Permanent Marking of Surveys," "Photography as Applied to Topographical Surveying," "Topographical Surveying," and "Geodetic Survey for Canada."

SOCIETY PROCEEDINGS.

Engineers' Club of Kansas City.—A regular meeting was held at Wallula, Kan., Sept. 7 by invitation of Mr. H. A. KEEFER, Vice President BREITHAUPT, in the chair; KENNETH ALLEN, Secretary.

On motion of Mr. MASON it was voted to appoint a committee to confer with a committee of the American Society of Civil Engineers and similar local committees with reference to a closer affiliation among the various engineering societies.

A paper on "Water Gas" was read by M. A. G. GLASWOG. The writer endeavored, primarily to correct the very general misconception the public entertains concerning the ultimate possibilities of "Water Gas," by demonstrating that absolutely no thermal advantage is derived from the use of the gases obtained by the decomposition of steam, but that for every unit of heat developed by the hydrogen thus obtained, an equivalent in carbon has been consumed in the generator. And further than this, that the use of steam is a source of actual loss, determining the percentage of heat thus lost. Incidentally, descriptions of the methods and modern apparatus for the manufacture of both fuel and illuminating water gas were given.

A paper was then read by Mr. H. A. KEEFER on "The Early Manufacture of Iron."

Smelting by Egyptians, done without blast in furnaces similar to lime kilns. The use of iron spread over Europe until the downfall of Rome, when Spain produced all the iron used until middle of the eighth century. France and Germany then took up its manufacture in Catalan forges, furnishing from 2 to 5 tons weekly, each.

Modern blast furnace appears about middle of thirteenth century, but England did not supply her own demand until middle of eighteenth century. The blast was usually supplied by bellows worked by water power.

1735. Coking coal begun. Abraham Daily.
" Cast-iron blowers invented. John Smeaton.
1769. Steam bellows invented. James Watt.
1783. Puddling and rolling in bars. Henry Cort.
1820. Puddling in France and Sweden begun.
1830. Puddling in Prussia begun.
Treatment of ores described.
1644. First successful furnace in America, near Lynn, Mass.
1740. Iron manufacture taken up in New York.
1715—1770. Great development in New Jersey and Pennsylvania, 300 to 400 tons per annum produced.

Value of iron and steel produced in United States 1888 far exceeded that of all other metals combined.

KENNETH ALLEN, *Secretary.*

Civil Engineers' Club of Cleveland, O.—At a recent meeting Mr. W. H. SEARLES presented a paper entitled "Notes on Civil Engineering in England." Mr. SEARLES was one of the party of engineers who went to Europe, and his paper was compiled from notes taken during his trip.

Association of North American Railroad Superintendents.—The eighteenth meeting of the Association will be held at Hotel Brunswick, Fifth Avenue and Twenty-sixth Street, New York City, on Monday, Oct. 7, 1889, at 11 A. M. Besides the regular routine business, the following reports will be received: Report of Committee on Roadway, J. B. MORROND, Chairman. (*a*) On Award of Prize for Best Treatise on Trackwork, etc. (*b*) On Rail Sections.

Report of Committee on Machinery, G. W. BEACH, Chairman. (*a*) On Steam-Heating of Trains. (*b*) On Train-Signal Apparatus.

Report of Committee on Transportation, ROBT. BLEE, Chairman. (*a*) On Uniform Forms for Time-Tables. (*b*) On Methods of Discipline.

Report of Special Committee on Rooms and Headquarters, C. W. BRADLEY, Acting Chairman.

Report of Special Committee on Relations with General Time Convention, President GADSDEN, Chairman, *ex-officio.*

Papers will be presented on special subjects; the adoption of a new constitution will be considered and the question of the establishment of relations with other organizations of railroad men will be taken up. A cordial invitation is extended to all Railroad Superintendents, past or present, to attend this meeting, and, if not members, to present their applications for membership.

C. A. HAMMOND, *Secretary,*
360 Atlantic Ave., Boston, Mass.

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AND
AMERICAN RAILWAY JOURNAL.

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CHAS. W. BAKER E. E. R. TRATMAN M. N. BAKER
ASSOCIATE EDITORS.
GEO. H. FROST . . . . . BUSINESS MANAGER

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Coming Technical Meetings.

American Institute of Mining Engineers.—The 8th meeting will be held at Ottawa, Ont., beginning Oct 1. Local Secy., B. T. A. Bell, 14 Metcalfe St., Ottawa. Secy., Prof. R. W. Raymond, 13 Burling slip, New York City.

American Society of Civil Engineers.—Regular meeting Oct 2. "Hydraulics of Fine Streams" by John R. Freeman. John Bogart, 127 E. 23d St., New York City.

Association of Civil Engineers, Dallas, Tex.—The next social meeting will be held Oct. 4. Secy., E. K. Smoot, Elm and Austin Sts.

Engineers' Club of Kansas City, Mo.—Next meeting, Oct. 7. "Stone Observations on Building Stone" by A. L. Waddell and W. D. Jenkins. Secy., Kenneth Allen, 310 Baird Building.

American Forestry Congress.—Annual convention at Philadelphia, Pa., Oct. 15 to 18. Secy., J. W. Harrison, Franklin Falls, N. H.

Boston Society of Civil Engineers.—Next meeting, Oct. 16. Secy., S. E. Tinkham, City Hall.

THE letter in another column, expressing the views of three distinguished engineers and Past-Presidents of the American Society of Civil Engineers in favor of Governor's Island as a site for the proposed great fair, deserves, and we have no doubt will receive, careful consideration from those interested, in case it proves impossible to secure a proper site within the recommended area without encroaching on Central Park, an encroachment which in our judgment will not and ought not to be permitted under any circumstances when there are so many other sites equally good. That Governor's Island is such a site we will not now assert, but there are many strong arguments in its favor, which at least prove it a more suitable site than Central Park itself. It is no longer needed for military purposes; it already comprises 68 acres; can be readily enlarged to 100 acres and later to 261 acres; *the buildings could be permanent,* and could be made a great ornament to the harbor and city. They could be used after the fair for any succeeding exhibitions, or for large political and other gatherings, or as a summer sanitarium for the poor, etc., etc. and in case of need as barracks or storehouses. For visitors from all directions except from Manhattan Island (i. e. for 60 per cent. or more of the visitors) it would be the most convenient of all sites; and if the exhibition be kept open till nearly midnight, and does not open till 9 A. M., the current of travel from Manhattan Island would not so seriously interfere with the regular traffic as to make that a great objection, since the regular "rush-hours" are over by 9 A. M. We do not question the Site Committee's judgment in favor of the Morningside-Riverside Park location, if that be in fact what their recommendation means, and if they are in fact working to secure that site. If their real meaning is that Central Park is to furnish the main area for the fair, it becomes another matter.

EVERY great city, to do itself justice, should have some spot permanently reserved for exceptionally great exhibitions and gatherings. Paris has such a spot in the Champs de Mars, and has had three successive expositions there. The necessity for it is recognized in the report of the Site Committee, which proposes that one of the buildings, of some 20 acres area and costing some $2,500,000, shall be permanent. A site offering some advantages for it would be across the north end of Central Park; but a worthy permanent building could hardly be erected upon such an area for such a sum. If it have a ground floor only, it must almost inevitably be squat and ugly; and it would soon, in any case, be solidly surrounded by buildings, which would effectually prevent its use for subsequent expositions. At Governor's Island, or at Inwood, this danger need not exist. The Island could be and soon would be enlarged to 200 acres or more, making a grand public pleasure ground, not to speak of its other uses, and an exhibition in 1900 might be made of twice the floor area of that of 1892 by simply adding as much more to what already existed. In other words, *all* the $6,300,000 which it is proposed to expend on large buildings would be saved instead of being practically all lost. It is probable also that a half-mile tunnel would be constructed before the exhibition opened to give direct communication with the Battery. The cost of such a tunnel should not be over $500,000, and if there were 10,000,000 visitors from Manhattan Island, 5 cts. toll from each would pay for it. Sooner than deface Central Park, let us by all means do this. For the present we go no further, but in the meantime commend the suggestion to the thoughtful consideration of all interested. It would be no slight gain to have left a grand $6,500,000 building, and a new and healthful pleasure resort for the people; and this would compensate for many disadvantages.

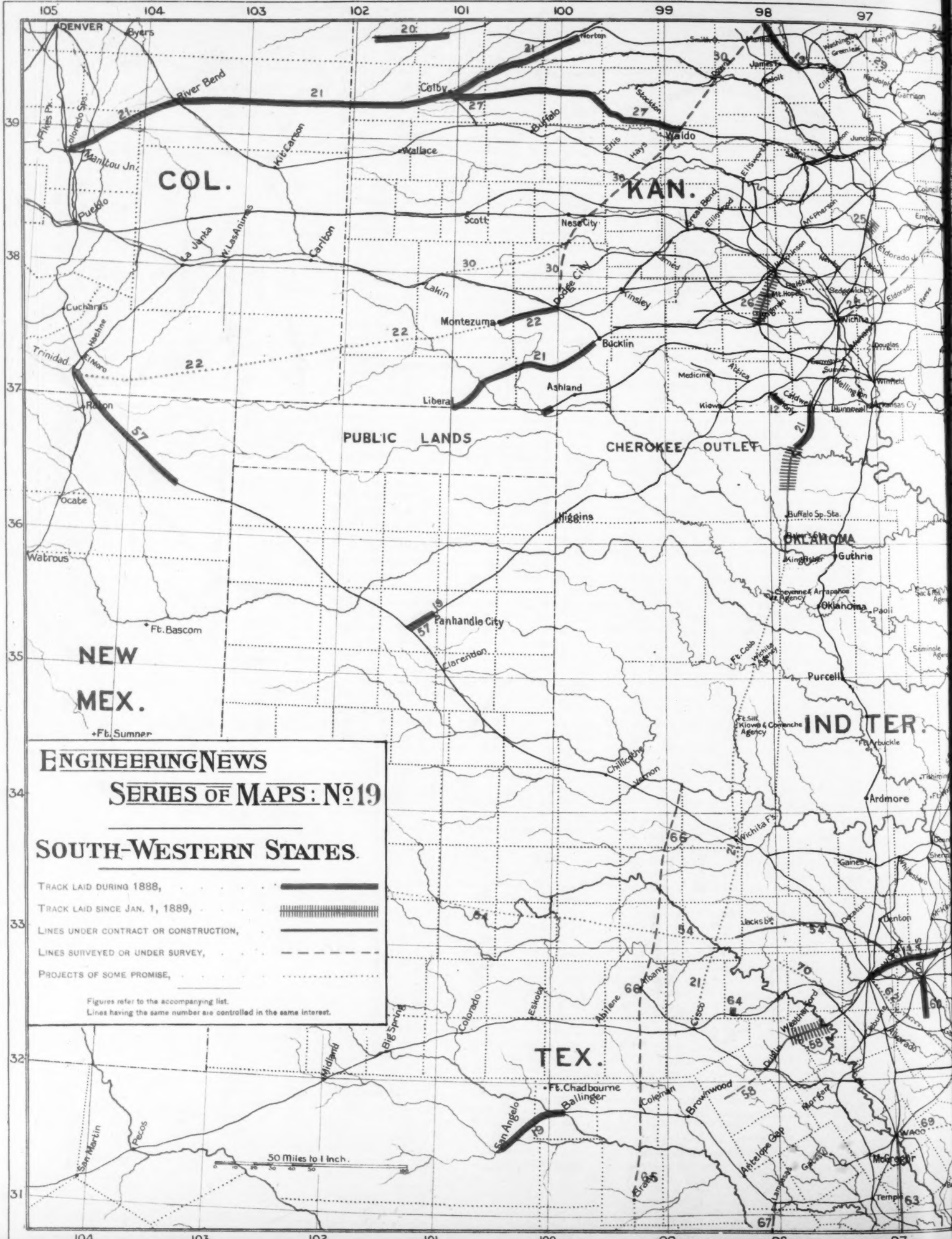
How many of our readers are now engaged in "preliminary studies" for the great 1,320 ft. tower which has been recommended by the Site Committee? Not a few, we may safely say; and no doubt the judgment of the committee was sound, that it would be a profitable feature, both in itself and as an adjunct to and crowd-drawer for the exposition; and that to have its full effect in this way it must be "the tallest tower in the world," outdoing the Eiffel tower. That it will outdo it in grace and beauty, however, seems hardly possible, as our readers will more fully realize by referring to its illustration in our issue of June 8, 1889 while the gain in view from having the tower 1,320 ft. high instead of 984 ft. or even 660 ft. is so trifling as to be quite insignificant, the tower needing to be four times as high to double the distance at which objects at sea level are visible, and much more than four times as high to double the distance of the actual horizon, 1,000 to 2,000 ft. above sea-level. The precise figures are as follows, neglecting any effect of high intermediate ground:

An object	Is visible from a tower; 660 ft. high	1,000 ft. high	1,320 ft. high
	at a distance of		
At sea-level	34.0 miles	41.8 miles	48.1 miles
440 ft. high	60.6 "	68.4 "	74.6 "
1,000 ft. high	75.8 "	83.7 "	89.9 "
2,440 ft. high	93.2 "	101.0 "	107.2 "
3,000 ft. high	106.5 "	114.3 "	120.5 "

If we remember that the vision becomes indistinct at a greater distance than 15 to 20 miles, the gain from going 320 ft. higher than the Eiffel tower, as shown (very nearly) by the difference between the last two columns, is too trifling for consideration, while the loss by reducing the height of the Eiffel tower even to 660 ft. is almost equally insignificant. It is therefore worthy of thought whether it would not be equally effective and a trifle less vulgar to avoid direct copy of M. EIFFEL'S idea and to build instead a spacious and roomy tower 600 to 700 ft. high as a part of one of the main buildings, dividing it into stories, and utilizing it for restaurants and other exhibition purposes.

THERE seems to be some prospect of an attempt to secure an appropriation in the next River and Harbor Bill of about $8,000,000 to open the Missouri river to navigation from St. Louis to Sioux City, Ia. The length of the river between these points is 781 miles, and the improvement would give water navigation to Kansas City, St. Joseph, Omaha, Sioux City, and a number of other important cities. If by the expenditure of that sum the Missouri river could be made reasonably safe for navigation to vessels drawing 12 ft. or less, and if the work once done would be reasonably permanent, there would be much to be said in favor of the scheme. From all our knowledge of the Missouri, however, the prospect seems to be that the first good-sized flood would undo the greater part of the work, and leave the river to meander as before through a labyrinth of sand bars and snags on its way to join the Mississippi. If the cities and towns which hope to reap the benefit from this work had to pay the $8,000,000 which it is estimated to cost out of their own pockets, they might be a little less hasty in calling for its expenditure. Whether the traffic which would be carried would ever attain a volume sufficient to justify the Government in making the expenditure, is another question which should be carefully studied before an appropriation is made.

THE Third Avenue Railway has finally got authority from the State Railroad Commission to substitute cable for horse-power on that avenue, on condition that the present center bearing or T rail be removed, and a flat, grooved rail put in its place, according to the repeated "demands" of the municipal officers, which have hitherto been unavailing; that the company shall duly clean its tracks of snow and ice, not simply sweeping it to one side; and that the speed shall be some undetermined amount below those proposed, 6 miles per hour below 6th St. and 8 miles per hour above it. These speeds it is clear are too high, and would result in killing a good many people, especially at first, since the ordinary speed of horse cars is but little more than 5 miles per hour. For the first year at least, the speed should be but slightly advanced over horse cars; but if there be any place in the world to which the cable seems especially adapted it is on Third Avenue and the Bowery. The street is wide, the traffic enormous and capable of indefinite increase. The loss by friction of cable, ordinarily some 50 per cent., will be very small here.



ENGINEERING NEWS
SERIES OF MAPS: No. 19

SOUTH-WESTERN STATES.

TRACK LAID DURING 1888,

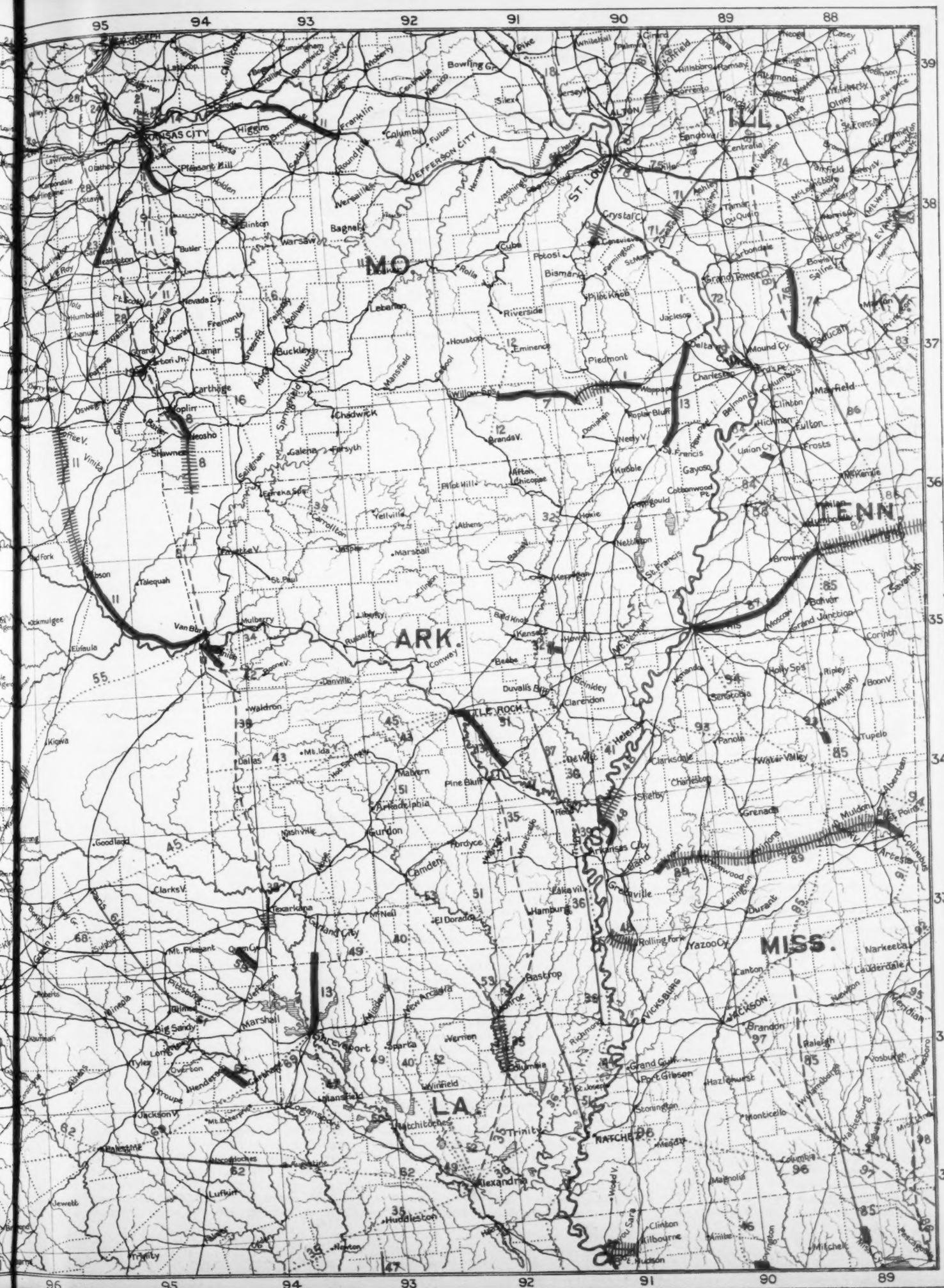
TRACK LAID SINCE JAN. 1, 1889,

LINES UNDER CONTRACT OR CONSTRUCTION,

LINES SURVEYED OR UNDER SURVEY,

PROJECTS OF SOME PROMISE,

Figures refer to the accompanying list.
Lines having the same number are controlled in the same interest.


MO
ILL.
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ARK.
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ST. LOUIS
JEFFERSON CITY
ALTON
LITTLE ROCK
MEMPHIS
VICKSBURG
JACKSON
NATCHEZ
Vinita
Miami
Afton
Chicopee
Pilot Hill
Eureka Spr.
Yellville
Athens
Marshall
Fayetteville
St. Paul
Van Buren
Mulberry
Russellville
Conway
Beebe
Danville
Waldron
Dallas
Mt. Ida
Mena
Hot Springs
Malvern
Pine Bluff
Arkadelphia
Nashville
Gurdon
Goodland
Camden
Fordyce
Clarksville
Texarkana
Mt. Pleasant
Quitman
Gilmer
Longview
Marshall
Big Sandy
Tyler
Overton
Henderson
Troupe
Jacksonville
Mt. Enterprise
Nacogdoches
Palestine
Lufkin
Jewett
Trinity
Huntsville
Normangee
Madisonville
Bastrop
New Arcadia
Vernon
Sparta
Winnfield
Jonesboro
Hodge
Ruston
Monroe
Columbia
Winnsboro
Mangham
Rayville
Delhi
Tallulah
Lake Providence
Hamburg
Eldorado
McNeil
Emerson
Stamps
Lewisville
Texarkana
Arkansas City
Greenville
Leland
Rolling Fork
Yazoo City
Vicksburg
Port Gibson
Grand Gulf
Hazlehurst
Crystal Cy
Ste. Genevieve
Farmington
Potosi
Cuba
Rolla
Bismarck
Pilot Knob
Riverside
Houston
Eminence
Willow Spgs.
Piedmont
Doniphan
Poplar Bluff
Neely's
Brandsville
Chadwick
Galena
Forsyth
Carthage
Joplin
Neosho
Seneca
Shawnee
Oswego
Columbus
Springfield
Buckley
Lamar
Fremont
Nevada Cy
Butler
Clinton
Warsaw
Bagnell
Versailles
Sedalia
Pleasant Hill
Lexington
Odessa
Higginsville
Franklin
Columbia
Fulton
Mexico
Centralia
Bowling Gr.
Pike
Silex
Jerseyville
Carrollton
Hardin
Kane
Whitehall
Girard
Virden
Litchfield
Nilwaukee
Ramsey
Hillsboro
Sorento
Vandalia
Greenville
Pocahontas
Casey
Effingham
Altamont
Mt. Vernon
Centralia
Sandoval
Salem
Nashville
Pinckneyville
Du Quoin
Tamaroa
Ashley
Mt. Carmel
Albion
Fairfield
Mt. Erie
Carmi
Harrisburg
Eldorado
Shawneetown
Metropolis
Golconda
Vienna
Anna
Cairo
Wickliffe
Bardwell
Arlington
Clinton
Hickman
Fulton
Union Cy
Mayfield
Paducan
Mound Cy
Grand Tower
Carbondale
Murphysboro
Herrin
Marion
Benton
Mt. Vernon
Fairfield
Olney
Lawrenceville
Robinson
Palestine
Sumner
Newton
Effingham
Mattoon
Charleston
Belmont
Humboldt
Tiptonville
Ridgely
Dyersburg
Halls
Brownsville
Jackson
Bolivar
Grand Junction
Corinth
Holly Springs
Ripley
Boonville
New Albany
Tupelo
Aberdeen
Columbus
Starkville
Macon
Meridian
Laurel
Hattiesburg
Lumberton
Waynesboro
Mobile
Pascagoula
Gulfport
Biloxi
Bay St. Louis
Pass Christian
Long Beach
Wiggins
Poplarville
Picayune
McComb City
Magnolia
Osyka
Tylertown
Summit
Natchez
Woodville
Centreville
Liberty
Amite
Clinton
Jackson
Brandon
Raleigh
Mendenhall
Magee
Prentiss
Bay Springs
Laurel
Ellisville
Richton
Lucedale
Wiggins
Gulfport
Biloxi
Pascagoula
Mobile
Citronelle
Chickasaw
Saraland
Tillmans Corner
Grand Bay
Bayou La Batre
Dauphin Island
Fort Morgan
Gulf Shores
Orange Beach
Perdido Beach
Foley
Elberta
Robertsdale
Fairhope
Daphne
Spanish Fort
Stockton
Bay Minette
Atmore
Brewton
East Brewton
Flomaton
Century
Jay
Milton
Pensacola
Gulf Breeze
Navarre
Destin
Fort Walton Beach
Valparaiso
Crestview
Baker
Holt
Niceville
Mary Esther
Shalimar
Eglin Field
Eglin Air Force Base
Milligan
Bonifay
Chipley
Caryville
Vernon
Westville
Ebro
Defuniak Springs
Freeport
Argo
Graceville
Marianna
Sneads
Quincy
Havana
Tallahassee
Monticello
Madison
Greenville
Perry
Lamont
Cairo
Thomasville
Boston
Meigs
Ochlocknee
Sycamore
Arabi
Doerun
Ashburn
Sylvester
Tifton
Ty Ty
Omega
Cordele
Vienna
Pinehurst
Dooly
Byron
Fort Valley
Perry
Hawkinsville
Abbeville
Unadilla
Cochran
Eastman
Hazlehurst
Baxley
Alma
Nicholls
Douglas
Willacoochee
Lakeland
Valdosta
Quitman
Adel
Nashville
Ocilla
Irwinville
Sycamore
Tifton
Ty Ty
Omega
Cordele
Vienna
Pinehurst
Dooly
Byron
Fort Valley
Perry
Hawkinsville
Abbeville
Unadilla
Cochran
Eastman
Hazlehurst
Baxley
Alma
Nicholls
Douglas
Willacoochee
Lakeland
Valdosta
Quitman
Adel
Nashville
Ocilla
Irwinville

Railway Construction in the Southwest.

The map and statistics of railway construction in the Southwest, which we present with this issue of ENGINEERING NEWS, show that considerable work is now in progress there, especially in the States of Louisiana, Arkansas, and Texas, and that the prospects of future activity in that section are very fair. The following table gives a summary by States of the mileage of new roads in various stages of progress.

States.	Track laid.		In process of constr'c-tion.	Located and under survey.	Projects of some promise.
	1888	1889			
Mo.....	270	86	97	199	810
Kan.....	508	50	.....	528	407
Ind. Ter.	105	94	117	.....	280
Ark.....	73	3	111	255	1,121
La.....	44	44	206	102	1,036
Tex.....	252	140	612	479	1,180
Total...	1,252	417	1,203	1,563	4,834

It will be seen that Texas is far in the lead, especially in the construction and tracklaying of the present year; while as regards future operations, as we have before predicted, Louisiana and Arkansas promise to furnish employment to a large number of engineers and contractors. In no State is the falling off in construction so noticeable as in Kansas, where 1,526 miles were built in 1886, 2,102 miles in 1887, and 508 miles in 1888. Thus far during the present year we have reports of but 50 miles of track laid; and if any mileage is now under actual construction in the State, we have failed to obtain any report of it. Missouri has laid as much track as in 1886, but has fallen off greatly from the 554 miles laid in 1887 and the 270 miles laid in 1888.

Our last map of construction in this section was published March 3, 1888. At that time our statistics showed in these States 1,254 miles under construction, 5,690 miles under survey, and 5,175 miles of projected lines. Reference to the above table shows that the mileage now under construction and projected varies little from this. The falling off in the mileage under survey is largely due to the fact that at the time our last map was issued people had not gotten over the excitement attendant upon the activity of 1887. The residents in the growing towns of the Southwest seemed to think that the great companies were to go on buying up the railways which were projected and located to further local real-estate interests. Men were ready to invest money in surveys for their pet schemes then, who are unwilling to do so now until they can see some chance of getting it back.

It is a feature of great interest to note the contrast in progress of work on extensions of the great systems two years ago, and now. In 1887 out of 4,058 miles of railway built in the above States, 3,431 miles, or about 85 per cent., were added to six systems, the Santa Fé, Missouri Pacific, Rock Island, St. Louis & San Francisco, Panhandle route, and St. Louis, Arkansas & Texas. Let us note what these companies are doing now. The Santa Fé is letting extensions severely alone and trying to earn money enough to pay its operating expenses and fixed charges, hoping that the expected development of the country along its new lines will soon increase its receipts to a living basis and avert the necessity of parting with any of its branches. The Missouri Pacific system has lost the International & Great Northern and the Missouri, Kansas & Texas. (See our map of the Southwestern systems in our issue of July 20.) The company has now nearly completed a line across Indian Territory, whose construction was made necessary by the loss of the Missouri, Kansas & Texas; and will probably soon build a line east from Fort Scott, Kan., about 30 miles, where a necessary link has been taken out by the same cause. Otherwise it too is doing nothing. The Chicago, Rock Island & Pacific is extending its line through Oklahoma, and has surveyed on south to reach points in northern Texas. Its extensive explorations for a route to the Pacific coast via New Mexico seem to have come to a halt along with various other projects. The St. Louis & San Francisco is wisely holding entirely aloof from extensions. Its managers are undeniably ambitious to control a considerable mileage in the growing State of Arkansas; but the time for gaining it is not yet ripe. The Fort Worth & Denver City (Panhandle route) is satisfied to let things rest as they are, and it has not pushed the hazardous experiment, which some of its backers were anxious to try, of paralleling existing roads all the way from Fort Worth to New Orleans. The St. Louis, Arkansas & Texas, most unfortunate of all, has had to relinquish its fine schemes for a Mississippi bridge at Grand Tower and an independent terminus at St. Louis, has defaulted on its interest dues, and is now in the hands of a receiver.

It is really wonderful, in view of the sorry times which Southwestern railways have had of late, that capital should still be found ready to engage in building local roads in this section. For if the great systems do not pay, how can short local railways be expected to? It is a well-known fact that consolidation tends always to reduce expenses and increase receipts. However, it is to be remembered that the builders of railways in this section are proceeding very slowly and cautiously. They are relying largely on local aid, and are building, generally, roads not of the most expensive type. By accompanying their railroad schemes with judicious speculations in real estate, the projectors and builders of these roads will be apt to come out with a snug profit from their work, after all.

The details of the work in progress in each State are elsewhere given; but brief reference to some of the more important enterprises may be of interest. In Missouri the most important enterprise now under way is the Cleveland, St. Louis & Kansas City, which has been before the public under one name or other for many years. The prominent features of this scheme are a Mississippi bridge at Alton and two Missouri bridges. The road will run when completed from St. Louis to Kansas City, but its early completion is still a matter of doubt. Among the other less pretentious enterprises in the State, one of those deserving of mention is the Chicago, Kansas City & Texas, which, despite its ambitious name, only aspires at most to reach from Kansas City to St. Joseph. The lines which are to reach from Kansas City south to Fort Smith, Ark., have been actively pushed by their promoters and seem eventually destined to go through. The projected lines in the State are most of them short ones in the vicinity of Kansas City.

In Kansas the most important line which is likely to be built for some time is the extension of the Kansas City, Wyandotte & Northwestern system from Carbondale southwest to Wichita. In the western part of the State, Dodge City is the headquarters for the railway projectors who propose to run a northeast and southwest line across the State and indefinitely beyond. The project certainly appears on the map to have considerable merit, so far as the Kansas portion is concerned, since it would intersect nearly a dozen railways. Central and western Kansas is at present deficient in north and south lines.

Some few of the numerous companies which were formed in Kansas two years ago to build long railway lines still keep up their organization; but the most of them have vanished along with the real estate booms which called them into life. We believe it was an observation of "the greatest living showman" that the American people like to be humbugged.

The northern half of Arkansas seems to have little to interest railway promoters at present, judging by the dearth of projected lines there. The southern half, however, and the portion of Louisiana included upon our map, are the scenes of very considerable activity. All the enterprises claim to be independent of the Gould systems; and most of them are of very considerable size. Among those which seem to be making the greatest headway are the Houston, Central Arkansas & Northern, the Louisiana, Arkansas & Missouri, the Kansas City, Watkins & Gulf, the New Orleans, Natchez & Fort Scott, and the New Orleans, Fort Jackson & Grand Isle. Among the enterprises of more modest proportions are the extension of the Augusta & Southeastern, a branch of the Batesville & Brinkley; the Arkansas & Gulf and the Stuttgart & Arkansas Post, which will together reach from Arkansas City north to Stuttgart, 80 miles; the Texarkana Northern, which is to reach from Texarkana to Fort Smith; the Central Arkansas, from Pine Bluff to the Mississippi river at Helena; and the Louisiana North and South, from Alexandria, La., to Hope, Ark., 175 miles.

The projects in the vicinity of Fort Smith, which have been so prominent for two years past, have not been heard from lately; and the schemes having Little Rock as an objective point have also become quiescent. It is not yet apparent, however, that any other town in Arkansas is to seriously rival these two as a railroad center.

In Louisiana the concentration of projects at Alexandria is quite noteworthy, the more so as its present population is not over 2,500. If all the various enterprises projected to reach there were to succeed, it would be a fertile field for real estate speculation. It must be remembered, however, that, as our map shows, railway construction in Louisiana is now in the stage of projection. We must expect considerable mortality among these projects as they grow older, and Alexandria's chances of becoming the metropolis of central Louisiana may be less numerous with their decrease. Shreveport, with its 10,000 inhabitants, and Monroe are likely to be important centers; while in the south, beyond the limits of our map, Lake Charles seems to be destined to outstrip the other towns of that somewhat backward section.

In Texas a good share of the work is south of the limits of our map; but will be shown in connection with our map of construction in the Rocky Mountain and Pacific States, now in preparation. The greatest amount of construction is being done by the San Antonio & Aransas Pass Company. A part of their line to Waco, only, appears upon our map. A company which is pushing work with a good deal of energy is the Red River, Sabine & Western, whose proposed line reaches from Fort Worth to Alexandria, La., 350 miles. The central portion from Palestine to San Augustine is now under contract. The Fort Worth & Rio Grande, running southwest from Fort Worth, is being extended this year about 50 miles. The Dallas, Pacific & Southeastern is being built from Dallas north and west to coal fields in Jack county. Its projectors profess an intention of continuing it to Albuquerque, N. M. Among minor enterprises in the State are a rapid transit rail-

way at Dennison, the extension of the Rio Grande & Eagle Pass up the Rio Grande valley, a line from Lampasas to Burnet, and the proposed "Cattle Trail" railway, to run north and south in the cattle country in the western part of the State. The company which is building a harbor at the mouth of the Brazos river has made some surveys to connect existing railways with their new port, and propose to make more extensive ones soon, to reach principal shipping points in the State.

We have noted elsewhere in this issue the important movement to secure a deep-water harbor on the Texas coast, which is now engaging the attention of the West and is especially important to the States which are included upon our map. No doubt, if it were possible to at once establish a harbor on the Texas coast with facilities as good as those of the port of New York, and to build a commercial city about it with all facilities for conducting a great export trade, there would be a great diversion of traffic from the long all-rail route to the Atlantic coast over the Allegheny mountains, and even from the water routes via the Great Lakes. It is fortunate for the financial prosperity of the whole country that such great changes in the currents of commerce proceed slowly. It will take many years to build up an important exporting city on the Gulf, and while the work is in progress the growth of traffic will give all interests room to adjust themselves to the changes which will come about.

The lines of the Rock Island and Missouri Pacific systems across Indian Territory have already been referred to. A new independent line is now under construction from Denison, Tex., to coal mines in Indian Territory and is projected to extend northeast to Fort Smith. All that is needed to inaugurate a boom in railway construction which would cover a good part of Indian Territory with a network of lines in two years time would be its opening to settlement under a territorial government. Probably not many years will elapse before the pressure of settlers upon our remaining public lands will make the move necessary.

The lines east of the Mississippi river, shown upon the map, were included in our lists of construction accompanying the maps in our issues of June 15 and August 3, and there are but few changes.

Taking the Southwest as a whole, and considering its fertility, its resources of timber and mineral wealth, and its deficiency in railway lines compared with other portions of the country, we see no reason to doubt that it is to be one of the leading sections in railway construction for some years to come.

The Site for the Proposed World's Fair.

If the fair should be lost for New York altogether as a consequence of the determined and persistent opposition which has been already aroused, and which is certain to continue, against the occupation of Central Park for the greater portion of the proposed exposition buildings, which seems at this writing the most probable outcome of the recommendations of the Site Committee elsewhere chronicled, it will be but the natural result of what we cannot but regard as a grievous mistake. Were the real choice Central Park or no suitable site at all, perhaps the temporary sacrifice of part of Central Park might be proper; but such is not the case. There are at least four other sites, lettered *A*, *B*, *C*, and *E* in the accompanying map, which have decided advantages; which may reasonably be claimed to offer nearly equal advantages. And surely the showman's view of the matter should not entirely control. The largest attendance is not the sole desideratum. Unless there were likely to be a very great difference in the attendance, and very great disadvantages in any other site, it would be discreditable to the civilization of the city of New York that it should mar the lovely work of art which is almost the only great public work within its limits which its citizens can look upon with unalloyed satisfaction, and it is certainly a dangerous policy to stir up antagonisms by the suggestion to do so, when united and earnest action is so necessary to success.

That it is necessary to success ought to be realized now while there is yet time. It seems to be too largely assumed in New York that its claims are so pre-eminent that neither Chicago nor any other city is likely to have a "show" in comparison, either in Congress or elsewhere. We cannot share this view. Our own interests lie entirely in having the great fair in this city, but, as we have before stated, there are many and strong reasons why such a fair should be held in Chicago, the chief of these being that local pride would be deeply stirred, as it was at Philadelphia, and that the whole city would be vigilant to have it properly managed and successful. New York has no local pride to speak of, and is too big and busy a city to give much thought to the matter during the long interval between initiation and completion, when a vigilant public interest and supervision is most essential to final success.

That the attendance would be larger at New York than at any other city, there can be no doubt, but there would hardly be as great difference as is often claimed. By referring back to the colored inset in our issue of April 27, 1889, the reader will see that the line of equidistance between Chicago and New York follows almost exactly that between the groups of States used in Poor's Railroad Manual and in our Water Works Manual, the New England, Middle, and South Atlantic groups being nearer New York, and the North Central, South Central, and all groups west, nearer Chicago. From the three groups nearer New York, there are only 34 Senators out of 84, or 39.3 per cent. From the 330 members of the House, there are only 155 out of 330 nearer New York, or 46.7 per cent. Assuming that the four Pacific States will be neutral and evenly divided, Chicago will still have, if the claims of locality govern, a majority of 8 in the Senate and 13 in the House.

Now let us suppose that, with this division of representation, Chicago comes to Congress, as it probably will, with $8,000,000 to $10,000,000 pledged and 2 per cent. paid in, and with an immense amount of wire pulling work by earnest men done in advance, and New York with little of such work done, less money actually pledged, and a site picked out which will be unattainable without action by the Legislature (the Legislature not convening until long after Congress meets) and against the use of which for exhibition purposes there will be an earnest and determined opposition both in the Legislature and in Congress. Will not the chances of New York being selected be at least dubious? Clearly they will, especially if we remember the fact above noted, which New York people and newspapers do not sufficiently bear in mind, or seem to be aware of, but which is sure to be fully shown in Congress,—that there is not likely to be such a material difference in the attendance and "gate money," after all, whether the fair is located at New York or Chicago. It may help to prevent any foolish carelessness as to chances, if we give the reasons for this conclusion somewhat fully.

The metropolis of New York (see ENGINEERING NEWS, April 28, 1888) is now a city of some 2,500,000 people, about equally divided between New York proper and Brooklyn, Jersey City, etc. Chicago has now a population of slightly over 1,000,000. By 1892 these cities may have about 3,000,000 and 1,250,000 respectively.

The resident population is the main reliance for attendance, but these great fairs draw enormously from points hundreds of miles off. Neglecting the Southern, Southwestern, and Pacific States, as likely to attend in about equal numbers an equally good fair at either city, and as too far off to have the attendance from them very large, there were in 1880, 15,766 thousand people in the New England and Middle States (including Maryland and Washington) and 15,256 thousand in the North Central and Northwestern States; but by 1892, it may be assumed with certainty from comparison with past ratios of growth, the Western total will have been increased some 36 per cent., or to 20,756, while the Eastern total will not increase more than 20 per cent. or to 18,916 thousand.

Now, without attempting any exact estimate, it will be generally admitted that each million of outside tributary population will contribute from one-fourth to one-tenth as many attendants as will the home population. If we "equate" the above specified population on this basis, we shall find that tributary to Chicago to be equivalent, on the one-fourth ratio, to a "home" population of 6,125,000 against 6,979,000 for New York, or as 87½ to 100; while on the one-tenth ratio we obtain 3,200,000 against 4,592,000, or 70 to 100, as the equivalent home population. The last is probably too low and the former too high, but either estimate shows ground for believing that the attendance at Chicago would be at least three-quarters or thereabouts of that at New York, bearing in mind the extremely low fares which will prevail and the much greater freedom with which western people travel. At any rate, it is beyond doubt that Chicago can make a good case to this effect before Congress.

This being so, it is especially unfortunate that even a tactical mistake should be made; and we cannot but feel that the committee's recommendations are at least a tactical mistake, if not a mistake of substance.

On the vast area of nearly 1,500 acres which they have recommended as "the" site, there are in reality three sites of 200 to 250 acres each, which is the most that is really required, viz., the Morningside-Riverside Park location (marked *B* on the accompanying map) the Central Park and northeast location (marked *C*), and the Central Park proper (marked *D*).

It is sufficiently clear that the "first choice" of the committee is location *B*, and with their decision that either *B* or *C* is preferable on the whole to the Inwood-Fort-George location (marked *A*), we are not disposed to quarrel. All three are fine sites, and either may be on the whole the best.

But if the committee rejected the Inwood site on the ground that it was at any material disadvantage as compared with the more southerly location, we think they erred: and the effect of rejecting all consideration of it, as also of the Governor's Island site, so ably advocated by three distinguished engineers in another column of this issue, is to introduce grave obstacles to obtaining land of private ownership on favorable terms. These obstacles are already felt. They may be overcome, and the committee may have had more reasons than have yet been made pub-

lic to believe they would be overcome; but if this is not very speedily accomplished, the effect will be to restrict the choice to Central Park proper, against the use of which there will be, and ought to be, the most determined opposition.

For it is evident that every owner of vacant lots will desire the exhibition to be quite near to, but not on his lots. His benefit is then greatest and his loss least. But as between having the exhibition on his lots and two or three miles off, he would prefer it on his lots, for the same reason. If, therefore, the committee had done as we hold they should have done,—made a preliminary report saying that there were three or four sites of almost equal advantages, and then waited a few days for public sentiment to crystallize and for definite offers to be made, they not only would have been more likely to make a choice which would have been universally accepted, but at least one if not two of the sites would have been likely to be offered to them almost free of cost, as we believe the Fort-George-Inwood site actually was.

As it is now, although they have in effect left a choice still open between three different sites, these sites are so close to each other that they largely overlap, and accordingly, the only tendency yet evident among the land-owners is, very naturally, the attempt of each to force the exhibition off his lots to the lots adjoining. This situation may change, and very suddenly; but it has not changed yet, and the evidences now are that a controlling minority, at least, of the land-owners around Central Park, feeling secure of having the exhibition near them in any case, are not disposed to make any concessions, but rather prefer than otherwise to force the exposition on to and in to Central Park.

The easiest way out of this dilemma, if it really exists, it strikes us, is for the committee to consider even now whether they may not wisely extend the range of choice by including also the Inwood and the Governor's Island sites, especially if it be the case, as we think it is, that at least one of these sites is intrinsically preferable to any other.

The cause for rejecting the Inwood site can only have been that it was nearly three miles further than the recommended sites from the center of population. In a sense, this is true; if it were true in a practical sense, there would be reason enough for rejecting it, but practically it is not true. A temporary or permanent extension of the Second and Third avenue elevated railways, for about three miles along the Harlem river, will enable all trains on both those lines, as also on the Sixth and Ninth avenue railways, to *terminate* their runs at the exhibition entrance. Now, comfort of transit more than slight differences of distance is the main consideration affecting attendance at such shows, and it is an immense advantage that the points where crowds are to be handled should be terminal stations. Any one can then get a seat by waiting for it, and can escape from the rush to enter the cars. Moreover, a lateral branch of about a mile must be built in any case to connect the exhibition with the Second, Third, and Fourth avenue tracks, and, taking into consideration the higher speed that could be maintained in the suggested Harlem river temporary extension, we question very much whether there would be any difference in time worth consideration in reaching the fair from any part of New York, while we are quite certain that there would not be enough difference to balance the gain in comfort which would result from having all trains start from the fair as a terminus.

The large attendance which will come via the Hudson River, New York Central, Harlem, and New York & New Haven would, of course, be somewhat better served by the Inwood site. For the large attendance via the Sound, it would be a matter of indifference. For the still larger attendance from Brooklyn and Long Island, and from New Jersey and the South and West, which will be a full half of the total attendance and will be almost wholly by boat at either site, the Inwood site would be at the slight disadvantage of two or three miles, say 10 to 15 minutes, extra sail; but such a sail is enjoyed in the summer, and we do not believe that this would have a sensible deterring influence upon attendance. Certainly we believe, and regard it as demonstrable, that the difference is not great enough to warrant incurring the very serious and determined opposition which the taking of any part of Central Park has excited, and will, and ought, to continue to excite. Large attendance is in every way desirable, but if the attendance be only 20,000,000 instead of 25,000,000 the public benefit will be almost as great, and that is the main purpose of such fairs.

The Site Committee lay down as the minimum necessary area 200 acres, of which 65 acres is to be covered by the main buildings. We question very much if even as much as 200 acres is really necessary or desirable. The present Paris Exposition is almost wholly confined to about 80 acres of the Champs de Mars, of which some 50 acres are under roof. At Philadelphia, there were 284½ acres enclosed, of which 60 acres were under roof for main buildings and 10 acres were for miscellaneous minor buildings; but this area was about twice as great as was really necessary, and the great distances between the buildings was rather a disadvantage than otherwise. We believe 100 to 150 acres is ample for all real needs, even assuming the exhibits to be all on one floor, as at prior exhibitions.

It is worthy of the most careful consideration, however, whether it is not expedient, at whatever site, to adopt the suggestion made in the communication in favor of the Governor's Island site which appears elsewhere, and seek "room higher up" rather than horizontally. Without pretending to have studied the details of the matter with sufficient care to express a positive opinion as to what could be done in this way, the idea is an attractive one to us, and seems capable of masterly architectural treatment, introducing a pleasing variation from past routine. It is obvious that if this be done, the difficulty of securing a proper site decreases, because the necessary area decreases; and if 85 to 100 acres be adjudged enough, as we believe it is, Governor's Island as well as Inwood becomes a feasible site, with many striking advantages in its favor. Sooner than see any part of Central Park used as a site (except for the Horticultural Hall, which, as it would be a permanent gigantic conservatory, it would be rather an advantage than otherwise to place in Central Park), or sooner than submit to even an attempt at financial pressure from land-owners around the Park, we should advise the use of either of these sites.

The Quadri-Centennial Exposition.

Twenty-two out of the 27 members of the Committee on Site and Buildings for the proposed great fair assembled on Sept. 20 and took the following action. The lion's share of the work of the committee seems to have been done by Messrs. JOHN BOGART and HENRY R. TOWNE, of the American Society of Civil Engineers. We cannot fully sympathize with their conclusions, as noted elsewhere, but the fact that the committee was almost unanimous as to site, and entirely so in respect to the site apart from Central Park, indicates that there are advantages in the Morningside-Riverside location as compared with the Inwood-Fort George site that we have not appreciated. That there is any great difference in the accessibility of the two sites we do not believe, as stated elsewhere; but either site is so good that there is no reason to quarrel with the choice, if it can be had. At the meeting Mr. BOGART said:

At the last meeting of the Committee on Site and Buildings a sub-committee on buildings was appointed, and I am instructed on behalf of that committee to present the following report. The report consists of the minutes of the transaction of the sub-committee at their meeting on Tuesday.

The report as submitted by Mr. BOGART, Secretary Am. Soc. C. E., who is State Engineer and Chairman of the Sub-Committee on Buildings, reads:

Minutes of meeting held Tuesday evening, Sept. 17, 1889. President: All members of the committee, viz: Messrs. BOGART, CHANDLER, CRIMMINS, HUNT, and TOWNE.

On motion Mr. BOGART was elected Chairman of the Committee, and Prof. CHANDLER, Secretary.

Mr. TOWNE submitted in detail the figures he had collated relating to the buildings of previous exhibitions, and his estimates of area and cost of the principal buildings for the Exhibition of 1892.

A vote of thanks was extended to Mr. TOWNE for the preparatory work done by him and submitted to the committee.

It was resolved: "That two hundred acres is the absolute minimum of land required for the Exhibition and that a much larger area is very desirable."

It was resolved that the area and cost of the principal buildings for the purposes of the preliminary competition and provisional plans be fixed as follows:

Buildings.	*Ground Area. Acres.*	*Cost.*
Main Building	25	$2,500,000
Machinery Hall	20	2,000,000
Agricultural Hall	10	750,000
Horticultural Hall	5	450,000
Art Building	5	600,000

It was suggested that the Machinery Hall should be made the permanent building, and that for this reason $500,000 should be transferred from the cost of the main building to that of the Machinery Hall, making the estimate for the former $2,000,000, and for the latter $2,500,000. This amendment was accepted and the resolution then adopted.

It was resolved: "That the question of providing suitable special buildings for an exhibit by the railroad and express companies and by electrical companies be left for future consideration, after consultation with representatives of other interests."

It was resolved: "To recommend that the Committee on Site and Buildings invite proposals for the erection of an observation tower not less than one-quarter mile (1,320 ft.) in height, to contain elevators, restaurants, and other accommodations for the public; the advertisement to specify provisionally the conditions of the concession, and proposals to state the percentage of receipts which the bidder offers to pay over to the administration in payment for the concession, and to state also the conditions under which, and the time when, the bidder proposes that the ownership of the tower shall rest in the city of New York."

It was resolved: "To recommend that the Committee on Site and Buildings authorize a special competition, open to architects and engineers, for the submission of plans for a system of transportation for visitors within the principal exposition buildings, the following prizes to be offered to the three most successful contestants, viz., a first prize of $1,500, a second prize of $1,000, and a third prize of $500. The requirements of the designs and terms of the competition to be formulated and announced in the advertisement."

It was resolved: "That the specifications for the competition for preliminary designs prepared and submitted by Mr. TOWNE be adopted with the changes and amendments which have been proposed during this session of the committee, and that it is hereby recommended to the committee on Site and Buildings that as soon as the funds are available these specifications shall be printed for distribution, and that due notice of the competition shall be published by suitable advertisements in the principal cities."

Mr. BOGART then offered the following resolutions:

Resolved, That this committee recommend to the General Committee that the site be selected from the lands between 97th and 127th Sts., Fourth Ave. and the North River, comprising Morningside and Riverside parks and the intermediate lands, Central Park north of the large reservoir, and the lands adjacent to that part of Central Park.

Mr. Towne offered the following preamble and resolutions as a substitute:

Whereas, This committee has, during the past few weeks, made a most careful study of the sites proposed for the exhibition; and

Whereas, It is the conviction of the committee that the prime factor in the selection of a site is accessibility to the greatest number of people; and

Whereas, This chief requirement is met by one of the proposed sites to an extent unapproached by any other location; and

Whereas, The site referred to possesses also a most commanding situation, natural attractions unsurpassed, if not unequaled, by any other, and facility for communication equal to, if not greater than, that of any other available site: and

Whereas, The committee believes that arrangements can be made upon equitable terms for the acquisition, either upon purchase or upon lease, for any private lands included in the proposed site;

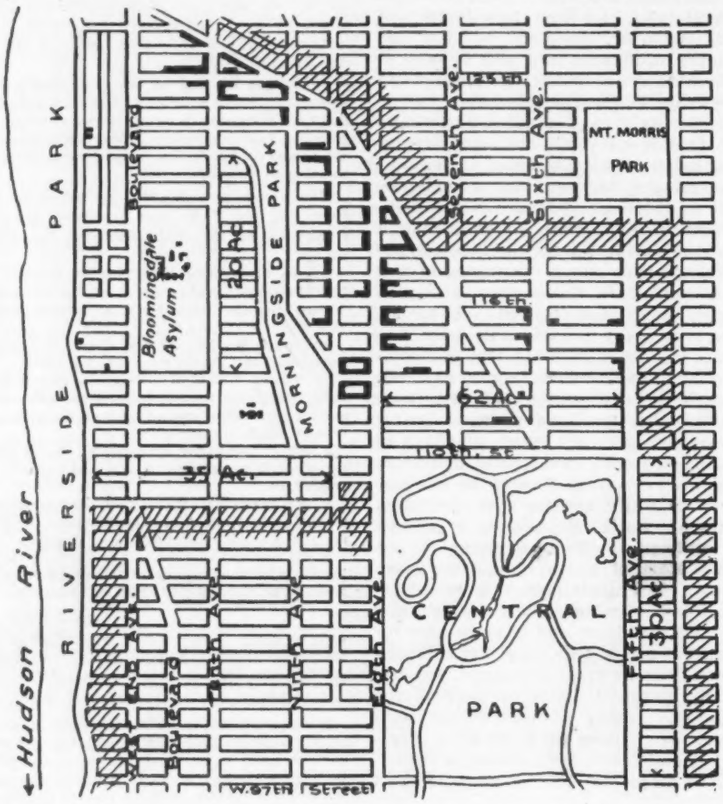
Resolved, That the Committee on Site and Buildings hereby adopts for the International Exposition of 1892 the location which includes Riverside and Morningside Parks, with lands contiguous thereto, including, if absolutely necessary, that portion of Central Park north of the large reservoir.

That as the private lands adjacent to said parks are of such character and extent as to admit of various alternate arrangements, and as the precise terms upon which the various plots can be had have not been fully ascertained, the committee prefers to withhold for the present the final determination of the exact area and limits of the exhibition grounds.

That to enable this decision to be promptly reached, is hereby resolved that the special Committee on Buildings shall be authorized to immediately obtain all necessary information regarding ownership and value of the lands in question, to ascertain from the several owners the precise terms upon which such lands can be acquired, and to report the results of their investigations to this committee at the earliest practicable date.

After considerable miscellaneous discussion and motion making, and strenuous objections by Mr. ANDREW H. GREEN and others to taking any part of Central Park, Mr. TOWNE'S motion was finally adopted by a vote of 14 to 2.

These recommendations seem to be accepted by the press as meaning that several large buildings are to be placed in Central Park, and a sharp difference of opinion as to whether this should be permitted or not has developed; the weight of opinion seeming to be that it should not be under any circumstances. There are as yet no indications of concessions by surrounding land-owners which will make extensive occupation of the Park unnecessary, nor have they any longer any stimulus to do so, since the committee's recommendation fixes the site in their immediate vicinity in any case.



Quadri-Centennial Exposition, Area Recommended by Site and Building Committee to Include the Site.

[The hatching indicates the limits of ground which is practically all covered by buildings and unavailable. Buildings of importance on the remainder of the area are shown in black. The area of various vacant spaces is shown in the plan, from which modes for disposal of buildings can be studied. The indications are that the ground occupied by the Bloomingdale Asylum, and the proposed site for the Episcopal Cathedral south-east thereof, now occupied by an orphan asylum, cannot be had for exposition uses.]

Our own view, expressed more fully elsewhere, is that the use of the Park for any other or more extensive buildings would be wholly inexcusable, for the reason that it is in no way necessary, and that it was at least a tactical mistake to restrict the choice so closely in a first report. The Fort-George-Inwood site has several great advantages over even the Central Park site; and that there is at least one other site of no slight merit, if a certain novelty of treatment be considered admissible, is indicated by the following letter, which we have received from three distinguished engineers, Messrs. JULIUS W. ADAMS, WM. E. WORTHEN, and WM. J. MCALPINE, all of them Past-Presidents of the American Society of Civil Engineers, and men whose opinion is entitled to great weight. They recommend Governor's Island as the best site for the fair, by very weighty arguments. The letter was prepared with a view to publication before the Site Committee reported; but as even that report is not yet binding, and may prove impossible to carry out, it is given publication now, and is well worth careful attention.

NEW YORK, Sept. 18, 1889.

TO THE EDITOR OF ENGINEERING NEWS:—

We have noticed with some surprise that in the matter of selecting a site for the proposed World's Fair for 1892, little or no mention has been made of Governor's Island. We can only suppose this to be due to the fact that no personal interest can be served by this selection; no real estate boom will accompany it, and no greedy speculators with Briarean arms, under the guise of public benefit, can hope to fill their own pockets at the expense of whom it may concern.

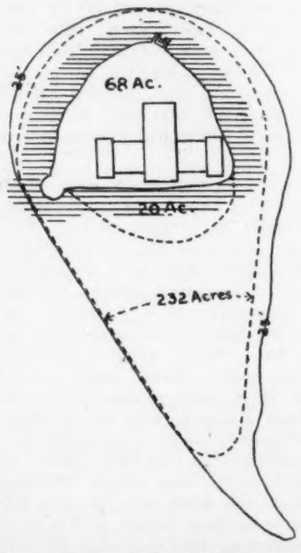
As briefly as possible, allow us to hint at some of the capabilities of this location.

The Island we will call about 70 acres in area. The southwestern shore from Castle William has a length of 2,600 ft. and on this shore an extensive shoal extends into the lower bay, a part of which can be utilized as shown further on.

Whoever has (and who has not?) visited one of the modern world's expositions must have painfully realized the interminable distances over which they are stretched out, and the consequent tediousness of visiting the exhibits of the necessarily widely separated nationalities. Now if there be anything in the way of improvements either of building or machinery, the development of which is distinctly American, it is the elevator, by means of which floor space may be indefinitely increased, and, so far from adding to the personal discomfort of visitors, may be made a positive relief to the weary sight-seer.

Our suggestion is to occupy 1,500 ft. of the width of Governor's Island, from west to east, as follows. A main central part of 400 ft., two adjacent wings of 350 ft. each, and two terminal pavilions each of 200 ft.; a total front of 1,500 ft. east and west. The central part to be 950 ft. north and south, to be six stories high, with an attic and dome of 300 ft. diameter. The pavilion to be 460 by 500 ft. and five stories high. The wings to be 400 ft. deep and three stories high. The stories to be, at least, 30 ft. in height, from tide level to top of dome below statue of Columbus to be some 450 ft. An esplanade covering 20 acres of the shore to extend the entire front, of circular outline, cribbed, piled, and floored. This will also furnish docking for the delivery by water of goods, with track, traveling cranes, etc. The gardens will fill the quadrants on the north part, giving some 10 acres. The ground-floor of the building will be 20 acres, but the floor spaces, disregarding galleries, will total 100 acres, which, with the garden and esplanade, will give 125 acres as the immediately available floor space area in and about the building, leaving the 50 remaining acres of the island for private exhibitors, or for annexes of small size and varied use, which could embrace the old fort for many purposes of exhibition.

Thus we see that, instead of accepting the common form of an extended shed, a more commodious method may be adopted, which gives far better architectural effect, with greater facilities of use and economy of management in space and time, by a well devised system of multiplied elevators of varied capacity and use with ready access to all points, and with the least possible fatigue to the visitor. The rotunda with its galleries under the spacious dome and the Central Hall can be made to facilitate this distribution.



Plan of Governor's Island, Showing Suggested 20 Acre Exposition Building.

[The dotted exterior line shows a possible future extension of the site to 232 acres.]

In a word, concentration with elevation, instead of extension on the ground floor, should be the prominent feature of the building; and this is especially desirable in view of the necessity which exists for a permanent building of this kind for the future use of the cities on the bay, equally accessible to either, as also to the suburbs, or the country at large, through the facilities afforded by a capacious and unobstructed water-way; and in this connection it is to be noted that, next to the American system of elevators, there is nothing so distinctly American as our commodious ferry-boats, with which there is nothing in the world really comparable, and which combine promptness and celerity of movement with almost unlimited accommodation, and with facility for the enforcement of the strictest police regulations. The "all-aroundness" of approach by water to

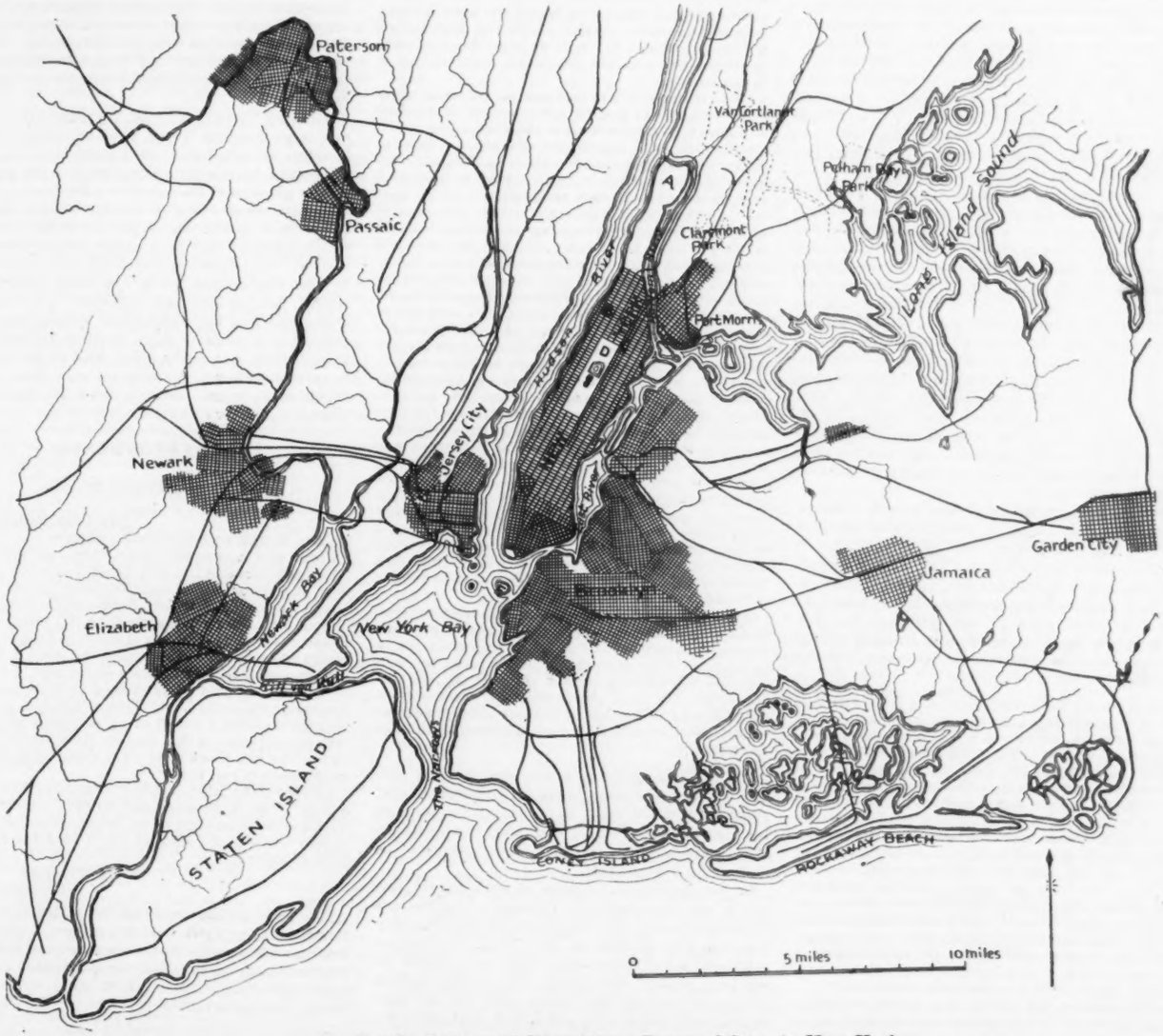
the Island from all quarters, foreign, coastwise, and inland (see general map), is unequaled by any site heretofore used for similar purposes, or suggested in this neighborhood. With a pontoon bridge 100 ft. wide, over Buttermilk Channel to the Erie basin, Brooklyn, a driveway and rail communication will be afforded with Brooklyn, and via the great East River bridge with New York.

The economy of electric lighting of the whole island and the feasibility of an independent water main from the Croton shed, furnishing fountains under a head heretofore unequaled in such exhibitions, are also evident.

acres of floor space. Anything beyond the larger area is superfluous and in a country of such "magnificent distances" as ours it would be a cheap form of magnificence, reminding one of an anecdote of the King of Prussia, who once, exhibiting to a newly accredited French ambassador the beauties of his capital, asked him, "Is Paris as large as Berlin?" to which the Frenchman replied, "We do not grow corn in Paris, your Majesty."

Setting aside, then, the rather vulgar view that the greater the number of acres, the bigger the show, it would seem that the site on Governor's Island offers advantages equaled by none other in point of accessibility, whether the visitor resides for the nonce in New York, or any adjacent settlement, and we may ask: Of the millions of our countrymen who may be induced to visit the exposition, and on whom its success will depend, how many would regard any landscape beauty which may be offered to them on Manhattan Island as an equivalent for the fatigues and annoyances which go to make such exhibitions a burden of the flesh? Where could the greatest amount of benefit be conferred, with the least expenditure of personal effort and money? What would better fill the eye of one, possibly dull to the "every-day view" of distant highland, rolling intervale, and a cultivated foreground of trees and shrubs, than a view of New York bay and the panorama of the adjacent shores and cities, with their active commercial life, under the constantly varying aspect of water and sky afforded by our bright and golden autumnal sunlight, as it would be seen from the galleries of the proposed exhibition building, several hundred feet above the sea level, occupying, as it were, the very centre of a picture as new and fresh to them as if created for their special benefit?

That the Island has ceased to be of importance from a military point of view is well understood, and it seems that its use as a department headquarters, which would be as well served by even a more restricted area elsewhere, might well give way to this demand for a national use; particularly as this would be only anticipating by a few years what is inevitable, and has been delayed only because that there was no popular movement calling for a better use of the property. With proper representations to Congress, there should be no obstacle to the immediate utilization for national purposes of what is little better at present than waste land. In the meantime, the



Quadri-Centennial Exposition.—Proposed Sites in New York.

[A. Inwood-Fort-George site. B. Morningside-Riverside Park site. C. Central Park and northeast site (the two main buildings and probably others north and east of the park; the remainder in it). D. Central Park site. E. Governor's Island site. Sites B, C, D, only, are in the area recommended by the Building and Site Committee.

All these advantages mark the site of Governor's Island as the one of all others best suited to the purpose of an exhibition of American and foreign progress.

There is still another point which may, with propriety, be urged in its favor, which is that it is preëminently desirable to avoid the appearance of pandering to local interest, and to impart a *national* character, so far as may be, to the celebration of the discovery of this continent by Columbus; and what so proper to that end as for the Government of the United States to appropriate, for such purpose, from its own territory, and within its own waters, the site of its own Fort Columbus in the bay of New York, as indicating the national character which it is the desire of the country to attach to this exposition?

With reference to the assumed advantages offered by other sites, of wide areas of ground, and drives, with charming little landscape views, in the upper part of the city of New York, a few words will suffice: As the avowed purpose of this exposition is not to exhibit our wealth of acres, it is becoming that we should keep that feature in the background.

The greatest exhibition yet had, that of Paris of this year, is included within 170 acres, with only some 50

preparation of material in the different workshops of the country could go on, and no time would be lost, providing that there was a reasonable assurance that possession of the site could be had by, say May, 1890, which will largely depend upon the subject being taken up by such journals as yours in the interest of the whole people.

Such adventitious aid as highland and river and bay scenery will not greatly aid to make this exposition a success. Such can be had anywhere. Nor can this exposition hope to rival that of Paris, unless by a system of management which shall tend to bring out, not only everything of native growth which the progress of our country has developed, but some *new* effects, and in addition to provoke a spirit of rivalry in our foreign contributors that will react upon ourselves, and render the exhibition really, and not merely in name, international. If it fails of this, it fails of success, and everything tending to put upon the enterprise the stamp of nationality should be fostered as of vital importance. The very first essential for this is that its site should be, as far as possible, a national and international one, open to the shipping of all nations, without hindrance or obstruction of any kind.

While this communication was prepared before the preliminary report of the Site and Building Committee had been rendered, we deem it for the public interest that it should appear nevertheless. No choice has been formally made. There is yet time to make the choice which seems to us by far the best.

J. W. ADAMS.
WM. E. WORTHEN.
WM. J. MCALPINE.

The views of three such distinguished civil engineers ought to have, and we doubt not will have, great weight with all interested. We are free to say that the plan outlined by them seems to us to have advantages so great and disadvantages so small as to make it in every way preferable to the occupation of Central Park at least, for reasons given more fully above, but which may be briefly summarized as: 1. Accessibility of site. 2. Probability of more visitors and "gate money." 3. Permanency of buildings and their subsequent great utility for many public purposes. 4. Novelty and originality of plan as compared with a mere copy of past plans. 5. Salubriousness of site for a summer exhibition in New York. 6. Probable less total cost. 7. A permanent ornament of the harbor of New York, and permanent site for all future exhibitions. Paris has now had three in succession in the Champs de Mars. We appreciate and summarize elsewhere the objections which probably led the committee to reject consideration of this site. They seemed to us at first of great moment, but on further consideration they appear rather imaginary than real, especially the great (if well-founded) objection that they would overwhelm the elevated railways by a current of travel coincident with, instead of opposed in direction to, the normal city travel. We cordially endorse, therefore, the suggestions of these three eminent engineers, as presenting a plan of conspicuous merit.

The Park Commissioners have passed a unanimous resolution objecting to any use of the park for the fair and stating that they will take all legal means to oppose it. Mr. FRED. LAW OLMSTED, the creator of the park, has made public the following very temperate but strong opinion opposing the use of the park, for any large buildings, the sentences which we italicize tending strongly to support the argument in favor of Governor's Island as a site.

New York has the advantage of any other city that can be proposed as a place for the celebration of the voyage of Columbus, *in that it is a seaport with broad waters open to the ocean. This advantage would be thrown away if the locality taken for the nucleus of the celebration should not be usefully and conspicuously connected with navigable water, and a relation of design secured between the principal features of the celebration and this water. There must be a "water gate" to the proposed exposition*, and this, having in view any part of the *now* proposed site, must be on the North river.

A direct line from the nearest point on the North river, passing through the Bloomingdale plateau and by the Morningside Park to the North Meadows of the Central Park, measures 1¼ miles, with three passages of mountain-like grades. With such deviations from directness as would be adopted for economy and convenience, the distance would be much more.

The only eminent place in which a structure covering several acres could be set, without great destruction and great preliminary expense in preparation of the ground, is the Bloomingdale plateau between Riverside and Morningside. If the principal part of the exhibition must, for the reasons thus suggested, be west of the Morningside declivity, it will be on land that is now private property.

The expense of taking this land, and of preparing extended and ample communication between different parts of the fair, *makes compactness of arrangement a desideratum of the first importance*, and to secure this compactness, together with a reasonably direct connection with the river, it would seem that the center of interest of the fair would be best on the broad, nearly level ground west of Morningside Park, and that such parts of it as cannot be there accommodated would best be on the nearest adjoining unoccupied level ground. This will be found on the east side of Morningside Park.

Regarding these as fundamental considerations, let the proposition to place a large building on the North Meadows of the Central Park be examined. The outline of the North Meadows may be likened to that of two irregular lobes connected by a crooked stem, the whole bordered by rocky ridges and plantations of from 30 to 50 years' growth, being the oldest trees in the park. The area available for building without an absolute destruction of these important natural landscape features is on one lobe about 6 acres, on the other about 10.

The distance between them and the nearest available building ground east of the Bloomingdale Heights is over half a mile, and the intermediate ground is rugged, broken, and in large part densely wooded; and it includes a rocky declivity from 50 to 100 ft. high.

Thought then, is to be given, first, to the difficulties of transportation with respect to the building and stocking of the structures required; secondly, to what would be necessary to be prepared for the movements of the public between buildings thus widely separated; thirdly, to the time that must be lost in passing between them; fourthly, to the unnecessary fatigue that visitors would thus be required to endure; fifthly, to the loss of architectural effect from the disassociation of the great visible exterior features of the fair.

It will be seen that, having regard to these considerations alone, the advantage of placing any large feature of the exhibition on the Park Meadows is much to be doubted. But there are others that ought not to be lightly treated.

I have no disposition to take part in any controversy on the subject, and I write solely because of inquiries that have been addressed to me, and which I feel bound, owing to the great importance of a wise decision, to answer as well as possible upon brief consideration. To do so, I must add that it appears probable to me that good use might be made of some localities of the Park for the exhibition of objects not needed to be brought within any of the larger buildings of the fair. If the fair is to center on a plot connecting Riverside and Morningside Parks, the Central Park will be a fine attachment to it, and it is probable that localities could be found in the Park for the exhibition of objects not required to stand in systematic connection with any of the classified exhibits. Buildings of moderate size for temporary use might be placed in it. But I am positive that no such structure as some have had it in view to place upon the North Meadows, with its necessary approaches and surroundings, could be provided for without involving a devastation that could never be repaired. I do not believe that it could be done without an enormous waste of the value of the Park for purposes to which it has been dedicated, and for which it has been prepared at great outlay. The results anticipated as the return for this outlay have but begun to be seen. They should be many times greater than they now are fifty years hence. The outlay upon the Park thus far should be regarded as an investment, the value of which lies almost wholly in dividends yet to come due. I do not believe that it is necessary to sacrifice one dollar's worth of these to secure the success of the fair.

If the proposition to occupy the North Meadows must be seriously discussed, then I should like to raise the question whether it would not, all things considered, be better to go a few hundred feet further south, and floor over the reservoirs, gaining a perfectly flat, elevated area of over 120 acres closely associated with the existing Museums of Art and of Natural History, and the vacant spaces reserved for future enlargements of these institutions.

The last suggestion is a new and weighty one; but the transportation facilities, although at first sight good, would really be far inferior to those of the Inwood-Fort-George, and Morningside-Riverside location, which latter, however, seems to be admittedly unattainable.

In the meantime, Chicago is working very actively and successfully. Chicago's preparations for obtaining the fair were begun on substantially the same plan as those of New York. The mayor appointed a big committee, which met, divided itself into smaller committees with clearly defined duties, and some of these bodies split up into subcommittees; but at this point New York and Chicago began to work on different lines. The Chicago men concentrated their efforts upon two points—to raise a big guarantee fund and to create sentiment in favor of Chicago as against any other city. In a very short time a plan for raising money was devised which has worked so far very well.

A stock company was incorporated under the laws of Illinois with a capital stock of $5,000,000, divided into shares of $10 each. The incorporators were all well-known business men, whose names would lend strength to any enterprise. The stock was offered to the public on these terms: 2 per cent. to be paid now, 18 per cent. when Chicago is decided upon as the site for the fair, and the remainder within two years from date. Every possible effort was then made to have this stock promptly taken up. The railways running into Chicago agreed to raise $1,250,000, the street railways of the city $250,000, and other enterprises responded in a like liberal fashion. Mr. GEO. M. PULLMAN subscribed $100,000, and MARSHALL FIELD is reported to have put his name down for a like sum. Hundreds of places were established all over the city where subscriptions to the stock could be made.

The result was that on Sept. 19, the Finance Committee announced that the five-million-dollar stock had all been taken, and at the same time that the stock would be increased to $10,000,000. The next $5,000,000 will doubtless be harder to get than the $5,000,000 already subscribed, but the ingenuity the financiers of the scheme have shown in the past presages success in the further efforts. The Mayor will issue a proclamation fixing a certain hour on Oct. 9, when subscription books will be opened in every factory in Chicago, and in that way the scheme will be brought directly to the attention of thousands of men, women, and children who otherwise would not be likely to give it a second thought. The first payment on a share is only 20 cts. It is a small sum to pay out, but in the aggregate the 2 per cent. subscriptions defray all the preliminary expenses.

Allowing liberally for possible exaggeration, there can be no question that a great guarantee fund is already subscribed, and that a much larger one will be secured by the time Congress is ready to take up the question of the location of the fair.

Chicago has also done an immense amount of work to create a public sentiment in its favor, a fact which indicates that it is deeply interested in the matter. The question of location is carefully kept in the background until the main question is settled, but the site most talked of is at Jackson Park, a part of the South Park system, about 300 acres in area, about 7 miles south of the city hall. If New York has really taken hold of the matter in earnest, however, it ought to win, since, other things being equal, there is no doubt that New York is the better spot for the fair.

CORRESPONDENCE.

ridge and Trestle Floors.

NEW YORK, Sept. 19, 1889.

TO THE EDITOR OF ENGINEERING NEWS:—

I read with interest and instruction your article on "Bridge Floors and the Flat Creek Disaster," in the Sept. 14, number of your valuable paper. A day or two later I read in the New York *Herald* that a locomotive jumped the track on the C. W. & M. bridge, near Goshen, Ind. The engineer stopped the train on the bridge just as it was about to leave the same, it having run for a considerable distance on the ties. I believe the profession would be interested to know just how this bridge was decked, and if you would find out and describe the same it would be of value as evidence of the practical value of that plan, as the description you gave of the Flat Creek trestle was evidence of the unsuitableness of that plan.

Apropos of the latter, as Chief Engineer of the W. O. & E. C. R. R., I designed, and we have just built, a trestle embodying some of the principles you advocate in your article above referred to. I send you a blue-print of the same.

Yours very truly,
RICHARD LAMB.

[The bents in the trestle shown on the blue-print referred to are 12 ft. between centers, 3 piles per bent, piles being 5 ft. between centers, and stiffened longitudinally by so-called "capping sills" extending longitudinally from pile to pile. The other dimensions are as follows:

Guard-rail—6 x 8 ins. dapped 1½ ins.

Ties 6 x 8 ins. x 10 ft. spaced 1 ft. from centre to centre.

Spacing pieces 2 x 4 ins. x 3 ft. 8 ins. nailed to lower side of tie to space between stringers.

Stringers 7 x 14 ins. x 12 ft. and 24 ins. long.

Packing pieces 2 x 14 ins. x 3 ft. curved at top with curve of 6 ft. radius, to be dapped at bottom 2 x 12 ins. to fit capping.

Caps 12 x 12 ins. x 12 ft.

Piles 12 ins. heart at largest end, "cypress" with bark off, 3 piles per bent, 5 ft. c. to c.

Bracing 2 x 10 ins. cross-bracing every bent laterally every third bent longitudinally, horizontal bracing longitudinally between bents not cross-braced.

IRON.—*Bolts.*—Guard-rail to ties ⅝ ins. diam. 12¼ ins. long; through stringers ⅝ ins. diam. 21 ins. long. *Drift bolts.*—Capping to piles, round iron ⅝ ins. x 2 ft. 0 ins. *Spikes.*—Spacing pieces to ties 4 ins.; bracing to piles and capping 7 ins.

The floor is well and solidly designed in itself, but being unprovided at the end with flaring guard-rails, collision-posts, or any form of rerailing guard, is as unsafe as the poorest floor for a train considerably off the track, which is the kind of train in most danger at such a point. Any kind of a floor is good enough for a train on the track, provided only the rails are solid.—ED. ENG. NEWS.]

Irrigation and Rock Dam Projects in Idaho.

ALBION, CASSIA CO., IDAHO, Aug. 24, 1889.

TO THE EDITOR OF ENGINEERING NEWS:—

You have mentioned the matter of a great Snake River canal several times, the last time on p. 510, June 23, 1888, referring to my report of April, 1888. I send, as a matter of reference, Surveyor-General STRAUGHAN'S report, made last winter.

Concerning canal systems near Minnidoka, noticed in your issue of Aug. 3, 1889, the upper outside edge of the land is about three miles from Minnidoka; Story's ferry is six miles from Minnidoka, on Snake river. Now the dam is the "key to the situation," and its construction is always quite a problem in this frontier country. About a year ago a series of editorial articles appeared in your paper, beginning July 28, about "Rock Fill Dams." This started us on an investigation, which, we think, has solved the question. The river at the proposed point of diversion forms a rapid, and is, for the most part, very shallow, no point exceeding 20 ft. in depth. The channel is about 75 ft. in width. The whole river is about 510 ft. in width, and outside of the channel will average under 3 ft. in depth. In high-water time at this point its maximum rise above the present stage is not over 7 ft. It then extends in width 550 ft. from the base of the south bluff to the base of the north bluff. The figures I have given are for the present low stage, which will last until the first of next April, that is, judging by previous years.

On the south side, there is at present a low, flat, rocky beach for 40 ft. in width, running to the base of the bluff, but covered during high-water time. The bluff rises perpendicularly 37 ft. From the brow it runs back nearly level and at right angles with the river for a mile or more; it is broken, however, by two cuts near the river face. Water would run through these cuts if the river was raised 22 ft. above the present stage. They [the cuts] are about 15 ft. in depth, 40 ft. in width, and make in towards the river 300 ft. below the proposed dam. There would be no great difficulty in constructing waste or side channels, for nature here needs but little assistance. The water could be regulated at the head of these cuts, and would flow down into the river again with a heavy grade over lava rock ledges. A head gate for the south canal could be easily placed; on the north side the solid rock bluff rises vertical from the river 18 ft., thence the slope is about 11° to a vertical height of 40 ft, or more, all solid rock. The bottom of the river is solid bed rock. The canal on the south side would be nearly all earth-work. On the north side the first mile would be about one-half rock excavation, the next half mile would be a little better, and from thence on it would be comparatively easy work, resembling the south side. A tramway could carry rock out of the canal to the dam; both could be constructed at the same time. For that matter, there is apparently enough loose slide rock (of all sizes, from 10 or 12 tons down) within a half mile of the site to construct the dam and accessories. All rock mentioned is lava rock.

These rapids are created by an immense ancient lava flow crossing the river above Story's Ferry, and the tracts of land we are intending to cover are evidently parts of the bed of an ancient lake. The beach on both north and south sides is well defined, and the basin is bounded on the west end, 30 miles from Story's Ferry, by a similar lava flow near Starrils' Ferry and at the head of the great Snake river cañon. Over half the river bank from Story's Ferry, on down on both sides, is good placer mining ground. Sanguine miners think there is gold enough in the Cassia county placers to pay the national debt. No doubt there is a great deal of gold there. The gold is very fine and requires careful mining. It also requires plenty of water under hydraulic pressure. This want the proposed canals would supply. All of this land and the site for proposed dam is accessible by good traveled roads from the railroad and other places at all seasons of the year. Timber for trestle work could be easily procured, and, as I have said, it is only six miles to the railroad. Irrigation schemes have been studied in the past two years, and no doubt 1,000,000 acres of good land in Cassia county can be covered by a system of reservoirs with canals from Snake river. At least 500,000 more acres are good, but will have to be reclaimed by other methods. All proposed canals will furnish almost unlimited water power, which, when land becomes more valuable, can probably be used for pumping water. Every stream has a heavy fall near the head. There are immense stores of subterranean water. Transmission of electrical power from places where there is abundant water power to other places where water has to be pumped may assist in the work of reclamation. You may have noticed that the *Salt Lake Tribune* gives an inch to the acre as the duty of water. In Cassia county it is half an inch, although in long canals some allowance would have to be made for evaporation and seepage. The approximate amount of water per acre that would have to be turned into the head of such a canal would be about ⅝ in. The State Engineer of California, and in fact the majority of Western engineers, make 50 irrigation inches (under a 4-in. pressure) equal to a flow of 1 cu. ft. per second. Some engineers say 48 ins. instead of 50 ins.

ENGINEERING NEWS is indeed an invaluable paper. May its shadow never grow less! Irrigation and Statehood are the all-absorbing questions in Idaho.

Yours truly,
FRANK RIBLETT.

Massachusetts Institute of Technology Courses.

Mass. Institute of Technology,
BOSTON, Mass. Sept. 22, 1889.

TO THE EDITOR OF ENGINEERING NEWS:—

The thanks of M. I. T. men are due you for the frank and explicit way in which you have corrected the error in your issue of the 14th inst., regarding the degrees conferred by this Institute. Only one brief remark seems called for by the statement, in your last issue: that according to the catalogue the subject of electricity is apparently not included in the course in civil engineering. It is not always possible, by looking over a statement of a course of study, as given in a catalogue, to gain a perfectly correct idea of everything that the course includes; and your remark is a natural one, since in this case electricity is not specifically mentioned. I beg leave to state, however, that a course in electricity is given to all regular students in the school, being a part of the course in Physics, which extends through two entire years, and includes both lectures and laboratory work. I may further remark, as bearing upon your observation, that civil engineering students are instructed in the principles of mechanism, and on the subjects of machinery and motors. And I would finally add, as touching upon the question of the differentiation of courses, that a graduate from our course in mechanical engineering cannot graduate afterward from the course in civil engineering (or vice versa) without two years additional work; and that I think it would be a remarkably "mature" mind that could compass this ground in two or three months, as you suggest. Thanking you for your correction, I am,

Yours truly,
GEO. T. SWAIN,
Professor of Civil Engineering.

[Beyond doubt, a course in Physics touches upon electricity, steam, machinery, motors, "principles of mechanism," and almost everything else in applied science. The Professor can hardly suppose us to have been ignorant of that fact, or to have lost sight of it. Our point is that such "instruction" does not amount to much; that there is not time in a four years' course to do much more than to *properly* ground students in that general knowledge of engineering elements which ought to be common to practitioners in any branch of it. Speaking not of the M. I. T., especially, by any means, for we well know it to be one of the best and most thorough of our technical schools, but of all such schools generally, it is a pity that instructors of youth do not more clearly perceive that the only real service which is rendered to the student is to train him to think, and to build up special knowledge for himself on a good foundation; and that this end would be much better attained by covering less ground, and covering it completely and well. For example, we have observed that a fair majority of the engineering graduates have not a working *mastery* of even the use of logarithms, and still less of geometry and trigonometry. They can use logarithms, as a child can pick out a tune with his finger on the piano, but they cannot use them readily, and consequently they soon drop the use of them altogether for ordinary computations.—ED. ENG. NEWS.]

THE SENATE IRRIGATION COMMITTEE, it is said, judge from the testimony taken thus far that more than 50 acres out of every 100 in the arid region can be made fertile by irrigation. It is reported that the Committee will recommend the appropriation by Congress of sufficient money to make a thorough survey of the arid lands.

RAILWAYS.

EAST OF CHICAGO.—Existing Roads.

Lake Shore & Michigan Southern.—A large amount of work is being done on the improvement of its roadbed by this company. The line has been nearly ballasted between Vermillion and Sandusky, O., and double track has been laid between Martin, O., and Oak Harbor. Nine miles of double track have also been laid on the air line division. In addition to the double tracking, several heavy grades have been sent down.

Louisville, New Albany & Chicago.—Surveys are reported completed for a line to run from a point on the main line at Salem, Ind., via Freetown, to Indianapolis, Ind., parallel to the Jefferson, Madison & Indianapolis R. R.

Cincinnati, Washington & Baltimore.—This road has been sold to EDWARD R. BACON, representing the Reorganization Committee, for $5,000,000. This is the first step in the new reorganization scheme, which includes the issue of $11,000,000 bonds, to run 100 years, guaranteed by the Baltimore & Ohio R. R. Co., at 4½ per cent. principal and interest. There will be an issue of $5,500,000 first income bonds at 5 per cent.; an issue of $6,400,000 second income bonds at 5 per cent.; an issue of $7,000,000 in third income bonds at 5 per cent.; an issue of $2,500,000 of preferred and $2,500,000 of common stock. The holders of preferred and common stock will operate the line of road.

Evansville & Terre Haute.—Tracklaying has been completed on the Evansville & Richmond R. R., from Seymour to Evansville, Ind.

Philadelphia & Reading.—The Camden County R. R. has been incorporated in New Jersey to build an extension of the Camden, Gloucester & Mt. Ephraim R. R. from Blackwood to Spring Mill, N. J.

Grand Trunk.—This company has called for tenders for the grading, masonry, tracklaying and ballasting on double track construction between Gananoque Junction and Belleville, Que.

Rockaway Valley.—This company has promised to build the extension from Pottersville to Peapack, N. J. 3 miles, on condition that the people subscribe $15,000 in aid of the enterprise. It is thought that this amount will be easily raised.

Projects and Surveys.

Phillips & Rangeley.—Ilsley & Cummings, of Portland, Me., have commenced the surveys for this proposed road. The road is projected to run from Phillips to Rangeley, Me., a distance of 27 miles. F. E. TIMBERLAKE, of Phillips, Me., is Secretary.

George's Valley.—Surveys will soon commence for this road, which is projected to run from Augusta to Warren, Me., a distance of 40 miles. HENRY HANCOX, of Hudson, Mass., is Chief Engineer.

Geneva & Lyons.—A press dispatch states that this company has filed maps with the clerk of Niagara county, N. Y., for a line of railway to run from Tonawanda to Suspension Bridge.

Wilson Terminal.—Organized in New York to build a line of railway from Wilson to the lake shore, a distance of 2½ miles.

White Rapids & Northern.—A company by this name has been organized to build a railway in Menominee county, Mich.

Morgan Run.—A railway company by this name has been organized in Ohio, with a capital stock of $10,000.

Gardiner & Tagus.—A project is on foot to build a railway from Gardiner to Tagus, Me.

SOUTHERN.—Existing Roads.

East & West Alabama.—This company has let the contract for the masonry for 7 new iron bridges on the main line to Cook & Collier, of Atlanta, Ga. The contract for building the bridges has been let to the Atlanta Bridge & Axle Co., of Atlanta. All of this work is now in progress. A change of road-bed, comprising about 75,000 cu. yds. of earth excavation, will soon be made, and tenders for the work will be asked for in a short time.

Louisville & Nashville.—This company is about to issue $13,000,000 of new stock: the money to be used in retiring an outstanding issue of $10,000,000 of 6 per cent. bonds and such other indebtedness as the company may decide upon.

Cape Fear & Yadkin Valley.—A press dispatch quotes Chief Engineer H. L. FRY as saying that tracklaying has been completed from Wilmington to Moore's creek in Pander county, a distance of about 24 miles. About 60 men are now at work and track is being laid at the rate of ¾ miles per day. The trestling is well advanced. It is announced that an extension from Bennettsville to Camden, S. C., is under consideration.——A report is in circulation that the Fayetteville & Florence R. R. running from Maxton, N. C., to the Pee Dee river, 40 miles, about 12 miles of which is graded, has been sold to a syndicate which will complete the road.

Seaboard Air Line.—A branch road from Osgood to Egypt, N. C., has been surveyed and it is stated will be built immediately.

Florence Northern.—The grading on the first 25 miles of this road from Florence north is nearly completed, and it is stated that tracklaying will soon commence. W. B. WOOD, of Florence, is President.

Union Point & White Plains.—This road running from Union Point to White Plains, Ga., 13 miles, has been completed and opened for traffic.

Charleston, Cincinnati & Chicago.—The Massachusetts & Southern Construction Co., which is building this road, has completed arrangements for placing $6,000,000 of bonds. The mortgage is given to the Boston Safe Deposit & Trust Co., and is secured on the property and franchises of the road.

Mobile & Ohio.—Surveys are reported in progress for an extension from Aberdeen, Miss., to Decatur, Ala., a distance of about 110 miles.

Georgia Southern & Florida.—Work is being pushed on this road. The line will be completed to Lake City, Fla., by Oct. 13, and it is expected that the entire line will be completed and in operation from Macon, Ga., to Palatka, Fla., by Dec. 1.

West Virginia Central.—It is announced that surveys are in progress for an extension of this road to Charleston, W. Va.

Clarksburg, Weston & Midland.—The contract for building the extension from Burnsville Station to Sutton, W. Va., has been let to Thomas J. Steers & Co

South Atlantic & Ohio.—The following are the officers of this company, which is building a railway from Clinchport to Big Stone Gap, Va., 28 miles: NATHANIEL THAYER, President; H. W. BATES, Vice-President and General Manager; JOHN JENKINS, Superintendent; T. H. WENTWORTH Jr., Secretary, and W. T. GORDON, Chief Engineer.

Projects and Surveys.

Seaboard R. R. Co. of Alabama.—Incorporated in Alabama to build a line of railway from Buckatanna, Miss., to a point on the Tombigbee river near Mount Vernon, Ala. Among the incorporators are: EDWARD O. UPHAM, of Mobile, Ls.; HORACE C. BURROWS, of Tarrytown, N. Y.; and ERASTUS H. BARNES, of Brooklyn, N. Y.

Macon & Birmingham.—Engineers are now at work on the locating surveys for this road, which is projected to run from Macon, Ga., to Birmingham, Ala., 210 miles. It is said that sufficient money has been secured to build the road and that construction will commence soon. F. S. JOHNSON is President and W. H. WELLS is Chief Engineer; both of Macon, Ga.

Greenville & Southeastern.— The survey of this road, which is projected to run from Greenville to Elba, Ala., a distance of 51 miles, has been completed.

Anniston & Montgomery.—Work is being pushed by this company preliminary to the early commencement of construction. JOHN W. NOBLE, of Anniston, Ala., is President.

Yazoo & Delta Central, — Sufficient money has been raised to make a preliminary survey of this proposed road. The road is projected to run from Yazoo City to Clarksdale, Miss., 60 miles.

Albany & Cordele.—The survey of this road, which is projected to run from Albany to Cordele, Ga., 35 miles, has been completed. J. W. ROBERTS, of Albany, Ga., is Chief Engineer.

Augusta & West Florida.—The officers of this road which is projected to run from Augusta to Thomasville, Ga., about 200 miles, are: President, C. E. SMITH, of Washington, Ga.; Vice-President, A. P. WRIGHT, Thomasville; Secretary and Treasurer, C. RHINO, of Augusta.

Evansville & Chattanooga.— It is stated that work will soon begin on the surveys for this road, which is projected to run from Evansville, Ind., to Chattanooga, Tenn.

Lower Blue Lick Springs.—Organized in Kentucky to build a line of railway from Carlisle, to the Lower Blue Lick Springs, a distance of about 10 miles. THOS. F. HARGIS, of Louisville, Ky., is interested.

NORTHWEST.—Existing Roads.

Duluth, Crookston & Northern.—E. W. LEWIS, of Fertile, Minn., Chief Engineer, sends us the following information concerning this enterprise:

The road is projected to run from Fertile Station on the Duluth & Manitoba branch of the Northern Pacific R. R. to Crookston, Minn., a distance of 23 miles. The work is generally light, with easy grades and curves. The principal business of the road will be in grain and the local traffic of Crookston. Nearly all of the right of way has been secured and about $50,000 has been subscribed by the city of Crookston. The contract for building the line has been let to Winston Bros., of St. Paul, Minn., who have the work well under way. It is expected that tracklaying will begin about Oct. 1 and the road be opened for traffic by Nov. 1. R. J. MONTAGUE, of Crookston, is President.

Winona & Southwestern.—The contract for building the 10-mile section of this road, from Bear creek station southwest, has been awarded to Gallighan & Leary. It is stated that work will be commenced at once and pushed to completion this season. D. M. WHEELER, of Winona, Minn., is Chief Engineer.

Abbotsford & Northeastern.—The grading on this Wisconsin road, from Abbotsford to Black Creek Falls, is reported completed. LINTON WILLIAMS, of Black Creek Falls, Wis., is Chief Engineer.

Great Northwest Central.—A press dispatch from Ottawa, Ont., states that this Manitoba road has been sold to an English syndicate which will complete the line. The road is projected to run from Brandon, Man., northwest to Battleford, a distance of 450 miles, of which about 50 miles have been partly graded and about 100 miles located.

Chicago, St. Paul, Minneapolis & Omaha.—The charter which this company had for building a railway from Niobrara to Atkinson, Neb., has been declared forfeited by the Nebraska Supreme Court. The charter was granted several years ago, but except making surveys and doing a small amount of grading, nothing has been done.

Burlington & Missouri River.—Proceedings have been commenced to forfeit the charter of the line from Culbertson Neb., to Holyoke, Col. The charter was granted in 1887 and the grading completed soon after, but nothing has been done since.

Louisville, Evansville & St. Louis.—Grading on this line from Belleville to Mt. Vernon, Ill. 67 miles, is making rapid progress. About 15 miles have been graded between Centralia and Belleville and about 300 men are now at work on the line. It is expected to have the line graded by Nov. 1, and tracklaying completed two weeks later.

Chicago, St. Paul & Kansas City.—The Rochester & St. Paul R. R. Co. has been incorporated in the interest of this company to build a railway from Rochester to Eden, Minn.

Projects and Surveys.

Joliet & Blue Island. — Incorporated in Illinois to build a line of railway from a point at or near Joliet, Ill., to Blue Island., Cook Co. Ill. The capital stock is $100,000, and the principal office is to be maintained at Chicago. The incorporators and first board of directors are: ADAM A. GOODRICH, of Jerseyville, and FRANK H. MCCULLOCH, FRANK H. POWER, HARRY P. YOUNG, and JAS. C. HUTCHINS, of Chicago.

Calumet & Blue Island.—Articles of incorporation have been filed in Illinois chartering this company to build a railway from a designated terminus in the city of Chicago to the village of Blue Island. Capital stock, $200,000. The principal office is to be maintained at Chicago, and the incorporators and first board of directors are the same as for the Joliet & Blue Island railway.

Chicago & Kenosha.—This company has been chartered in Illinois to build a railway from a designated terminus in the city of Chicago to a point on the Illinois State line in the county of Lake. Capital stock, $100,000. Principal office at Chicago. The incorporators and first board of directors are the same as for the Joliet & Blue Island railway.

Sheboygan & Southwestern.—Chartered in Wisconsin to build a railway from Sheboygan to Waldo, Wis., 15 miles. Among the incorporators are: P. Q. KROZ, A. F. WINTER, and MARTIN A. BODENSTEIN.

Huron, Chamberlain & Black Hills.—Surveys have been commenced for this road, which is projected to run from Chamberlain to Huron, Dak.

SOUTHWEST.—Existing Roads.

Texarkana & Shreveport.—G. W. FOUKE, of Texarkana, Ark., President, has sent in the following information concerning this enterprise:

The road is to run from Texarkana, Ark., to Shreveport, La., a distance of 70 miles. The principal business of the road will be in timber and farm produce. About 16 miles of the line is graded and 14 miles of track laid. The road will be operated for the present as a timber road with the intention of doing a general traffic as soon as conditions warrant.

Chicago, Kansas City & Texas.—Surveys are now in progress on the line from Smithville to Grayson, Mo. It is stated that as soon as the survey is completed bids for the construction of the line will be asked for.

Projects and Surveys.

Kansas City & Suburban Belt.—The contract for the construction of this 20 mile railway has been let to Smith & Bradbury, of Kansas City, Mo. It is stated that work will commence at once. E. L. MARTIN, of Kansas City, is President.

ROCKY MT. AND PACIFIC.—Existing Roads.

Southern Pacific.—Track has been laid on the line of this road in California from near Paloma to Santa Margarita, 3.95 miles, from Monterey to Lake Majilla, 4.43 miles, and from Newman to a temporary terminus, 21.39 miles, since Jan. 1, 1889. Grading is being pushed on the line from Knight's Landing to Marysville.

Fairhaven & Southern. —Work is being pushed on this line. From New Westminster to the boundary line, the line has been cleared and 21 miles of the road, bed graded ready for tracklaying. Twenty-six miles north from Fairhaven, W. T., have been located and the right of way is now being cleared. Construction is in progress on the line from Fairhaven to Seattle.

Union Pacific.—The surveys have been completed for the proposed extension to the Yellowstone National Park. The route is said to be favorable, with very little heavy grading and no tunnels. The length of the branch will be 65 miles.—The preliminary survey for the line from Oro Fino to Deer Lodge, Mont., has been completed.

North Pacific Coast.—About 100 men are now at work on the San Francisco, Tamalpais & Bolinos R. R., and the line has been graded as far as the bottom of Sawmill Gulch. It is expected to have this portion of line in operation by Oct. 1. The road is to run from a point on the main line of the N. P. C. R. R. between Manzanita and Blithedale up Sawmill gulch to the foot of Mt. Tamalpais and ultimately to Bolinas, Cal. Only a portion of the line will be completed this season.

Denver & Rio Grande.—The contract for building the cog-wheel road from Manitou up Pike's Peak is reported let. Work is to commence at once and the road to be completed and in operation by May 1, 1890.—A report is in circulation that this company is negotiating for the control of the Santa Fé Southern R. R.—The Rio Grande Junction Railway Co. has advertised for proposals for grading the line from Rifle Creek to Grand Junction, Col.

Projects and Surveys.

Pueblo & Western.—Surveys are reported in progress for a railway to run from Pueblo, Col., via Beulah, to Silver Cliff, Col. JOHN C. TELLER, of Denver, is at the head of the enterprise.

Little Book Cliff.—Incorporated in Colorado to build a railway from Grand Junction to Book Cliff, Col. Among the incorporators are: W. J. QUINN, N. N. SMITH, and W. T. CARPENTER, all of Grand Junction.

RAPID TRANSIT.

Electric Railways. — ***Brooklyn, N. Y.*** —The sale of the franchise for a line on Montague St. to Wall St. ferry has been adjourned, the bids not having been considered as made in good faith.

Albany, N. Y.—The Albany Ry. Co. has been granted a franchise permitting it to operate its cars by electric motors.——A trial run has been made on the Broadway line; the Thomson-Houston system is used.

Utica, N. Y.—The Belt Line Ry. Co. has applied to the State Railroad Commission for permission to change its motive power from horses to electricity.

Reading, Pa.—The Reading Electric Ry. Co. has been granted permission to erect poles and wires.

Washington, Pa.—The Washington Electric Street Ry. Co. has been organized and has adopted the Sprague system. The road will be 3 miles long. President, L. N. SINGLEY, of Washington; Treasurer, I. N. SILVERMAN, of Pittsburg.

Norfolk, Va. — An electric railway is to be built at Berkley by M. W. Mason, who is in the market for 30-lb. steel rails, electric plant, machinery, etc.

Asheville, N. C.—The electric railway is to be extended along Patton Ave.

Waukesha, Wis.—A franchise for an electric line 3½ miles long has been granted to Fitch & Jarvis.

Waco, Tex.—A franchise has been granted for an electric railway 5 miles long.

The Sprague Electric Railway & Motor Co. will shortly have the Lindell Ave. line at St. Louis, Mo., in operation; there will be 10 cars. Contracts have been closed for the Dayton & Soldier's Home Ry., at Dayton, O., and the Dallas Rapid Transit Co., of Dallas, Tex.

Elevated Railway.—***Chicago, Ill.***—The Lake Street Elevated Ry. Co., which has adopted the Meigs system of elevated road engines and rolling stock, has let the contract for the iron work to A. & P. Roberts & Co., of the Pencoyd Iron Works. Two miles are to be completed by January. The contractors for the work are Alberger & Fitzgerald, of Lake and La Salle Sts. The President of the company is PATRICK H. RICE; Secretary, O. W. BRUNER; Treasurer, M. C. MCDONALD; Engineer and Superintendent, W. S. L. BAILEY. The road is bonded for only $200,000 per mile.

Cable Railways.—***Grand Rapids, Mich.***—The Valley City Street & Cable Ry. Co. has awarded the contract for its cable machinery to the Walker Mfg. Co., of Cleveland, O.

Portland, Ore.—A cable road up the hill from the end of Gibbs St. is being built by Mr. FRANK PRANTL.

Los Angeles, Cal.—The Grand Ave. line of the Los Angeles Cable Ry. Co. has been put in operation, connecting the Plaza and Boyle Heights lines.

Street Railways.—***Philadelphia, Pa.***—The People's Passenger Ry. will be extended through the 26th ward.

Washington, D. C.—The Columbia Ry. Co. proposes to lay grooved rails.

Richmond, Va.—The Southside Land & Improvement Co. has been granted permission to build a street railway.

Greenville, Ala.—Work is in progress on the street railway; a double line will be built over part of the route.

Aspen, Col.—A street railway franchise has been granted to J. M. MCMICHAEL, of Aspen, and J. E. LINCOLN, of Liberty, Mo

HIGHWAYS.

Missouri Roads.—A new mass meeting of the citizens of Clay and Platt counties was held recently at Barry, Mo., to inaugurate a movement to secure better roads under the Gash road law, which was adopted by the last Legislature. Committees were appointed and resolutions passed. Much interest was manifested, and it was decided to hold meetings in all the townships of the two counties and get the people so thoroughly interested in the great need of better highways that general action will be taken on the subject. This is perhaps the first step taken in the State to improve county roads under the new law. The measure authorizes the county court, on being petitioned by one-tenth of the taxpaying citizens of each township, to submit to a vote of the people a proposition to create indebtedness for the improvement

of roads. If two-thirds of the voters at the election favor it, the court is then authorized to issue bonds or other forms of indebtedness.

Milburn, N. J.—Milburn suffered considerably from the July floods, and roads, bridges, and dams require extensive repairs. There is a venerable law under which in former times each male inhabitant was called upon to appear or furnish a substitute for a day's or several days' work on the roads under the direction of the road superintendent. The amount of labor required was apportioned according to the tax valuations. When the people of Milburn found that, under ordinary methods, the task of completing the repairs of the roads, etc., would be herculean they decided to resuscitate the old law of 1846 and enforce it. Every male inhabitant received notice from Town Clerk R. S. OLIVER that he must appear at a certain time and work on the roads. Each had a place assigned him.—*Newark Advertiser.*

CONTRACTING.

Sewers. — ***Louisville, Ky.*** — Contracts have been awarded to M. J. Bannon. The prices averaged as follows: earth excavation, 32 cts. per cu. yd.; laying brick in sewer, $5.20 per 1,000; for laying 18-in. pipe, 15 cts. per ft.; laying 12-in. pipe, 10 cts. per ft.; laying dripstone, 50 cts. per ft.; laying new curb, 65 cts. per ft.; loose rock excavation, 65 cts. per cu. yd.; solid rock excavation, $2.50 per cu. yd.; borrowed fill, 20 cts. per cu. yd.

Albany, N. Y. —The contract for the Judson St. drain has been awarded to John Doyle: 12 and 15-in. pipe, $1 and $1.25 per ft.; Y branches, $3.55 each; lampholes, $15.

Baltimore, Md. — Contracts for supplying material for the construction of the Eager St. sewer have been awarded as follows: Hand-made brick, to Young O. Wilson at $8.95 per 1,000; machine-made, to the Maryland Brick Co. at $6.50 per 1,000; sewer blocks, to Gill & Johnson at $95 per 1,000; sand, John Reddington at 80 cts. per cu. yd.; stone, to John G. Schwind at $1.79 (average) per cu. yd.

Street Work.—***Brooklyn, N. Y.***—The following contracts for granite block paving have been awarded by J. P. ADAMS, Commissioner of City Works: on Knickerbocker Ave.: E. J. McKeever & Co., $2.45 per sq. yd. for pavement, 35 cts. per lin. ft. for improvement, 65 cts. per lin. ft. for new curb, 55 cts. per sq. ft. for new bridge stone, 5 cts. per sq. ft. for reflagging. On North 6th St.: Wm. Kelly: $2.18, 10 cts., 60 cts., 40 cts., 1 ct. On Partition St.: Dennis Norton: $2.15, 15 cts., 54 cts., 38 cts., 2½ cts. On 4th St.: Wm. Kelly: $2.22, 33 cts., 55 cts., 50 cts., 30 cts. per sq. yd. for cobblestone pavement. On Johnson Ave.: Wm. Kelly: $2.15, 20 cts., 55 cts., 40 cts., 1 ct. for reflagging. On Broadway: Wm. Kelly: $2.22, 15 cts., 60 cts., 40 cts., 2 cts.

Pioneer Fireproof Construction Co., of Chicago: Bid for fire proofing only, $22,000.

Hough, Ketcham & Co.'s Iron Works, Indianapolis Ind: Iron works only, $43,000 to $45,000.

J. C. Salsbury, Shabe & Jackson, Omaha: Four bids, ranging from $246,131 to $250,131.

C. Specht, Omaha: Galvanized iron and cornice work only, $8,300.

Johnson & Field, Omaha: Two bids, $340,158 and $346,158.

Ryan & Walsh, Omaha: Two bids, $297,172 and $309,172.

James A. McGonigle, Omaha: $328,551.

W. T. Murphy, Omaha: $318,000 or $340,000, and to allow $4,000 for old material.

The contract was awarded to J. F. Coots, the kind of work and material to be determined by the Committee on Public Buildings and the architect.

Jails.—The following proposals have been received for the construction of a county jail at Kansas City, Kan.: Evans & Co., Topeka, Kan., $19,850; J. A. Dahlgren, Kansas City, Kan., $19,975; W. N. Lovett, Kansas City, Mo., $21,000; Evans & Co., Topeka, $23,000. The contract was awarded to J. A. Dahlgren.——The contract for a new jail at Windsor, Vt., has been awarded to the Berlin Iron Bridge Co., of East Berlin, Conn.

Approaches.—The contract for approaches to the post office at Minneapolis has been awarded to Martin Hendricks, at $10,150.——Larkworthy & Menke, of Quincy, Ill., have been awarded the contract for constructing the approaches to the Keokuk, Ia., public building at a cost of $6,735.

Contractors' Directory.—After classifying all the names which we knew, from our own letter files and subscription list, to be real, live people, with "a local habitation and a name," we started in to revise the "reliable" lists which we found in certain other publications. We mailed over 1,000 sealed letters, with "return" request, enclosing a request for business cards, or some indication of actual existence and whereabouts, and also specialty. The returns already received are interesting. A large percentage are "contractors" only, which does not entitle the parties to privilege of being included in our directory. "A bridge foreman;" "party is dead;" "not known at this office and not in city directory;" "left the place;" "no such office in State;" wood working machinery;" "horses and trucks to hire by day or week;" "bridge painter;" "lumber merchant;" "artists' materials,"—these are from a list of "railroad contractors," and represent the returns of three days' mails. When we publish our "Directory of Railroad Contractors," in the "Atlas of Railway Construction," it will be a list of railway contractors, and live ones at that.

Pipe Sewers.—***Willimantic, Conn.***—The following proposals for sewers were received Sept. 14 by Mr. GEO. W. MELONY, Chairman of the Special Sewer Committee. The contract was awarded to A. Brazos & Sons.

Pipe Sewer		Wilber & Van Etten, Rondout, N. Y.		A. Brazos & Sons, Middletown, Conn.		Robert Fenton Willimantic, Conn.		G. R. Hardy, & C. Blakeslee, New Haven, Conn.		Edward McManus, Waterbury, Conn.		C. H. Wellington, Oxford, Mass.	
Size	Length												
		$	$	$	$	$	$	$	$	$	$	$	$
15-in.	640 ft.	1.30	832	0.80	512.00	1.20	768	1.64	857.60	1.27	812.80	1.20	768.00
12-in.	1,480 "	1.20	1,776	0.75	1,110.00	1.15	1,702	1.24	1,835.20	1.17	1,731.60	0.98	1,450.40
8-in.	590 "	1.10	649	0.74	436.60	1.10	649	1.15	678.50	1.00	590.00	0.85	501.50
6-in.	1,560 "	1.00	1,560	0.73	1,138.80	0.90	1,404	1.08	1,684.80	0.95	1,482.00	0.80	1,248.00
Manh'les	17	60.	1,020	50.	850.00	55.	935	50.	850.00	40.	680.00	45.	765.00
Total	.....		$5,837		$4,047.40		$5,458		$5,906.10		$5,296.40		$4,732.90

Los Angeles, Cal.—Contracts for grading, gravelling and curbing have been let to F. W. Barron at $2.64 per lin. ft., and to S. C. Hubbell at $2.50 per lin. ft.

Dredging.—The following proposals were received Sept. 16 at the U. S. Army Building, New York City, for dredging the channel of the Passaic river from the Newark & New York railway bridge to Lister's dock R. G. Packard, New York City, 22 cts.: P. Sanford Ross, Jersey City, N. J., 22½ cts.

The Superintendent of Sewers, Boston, Mass., has been authorized to spend $1,400 in dredging the Roxbury canal.

Building.—The Supervising Architect of the Treasury Department, at Washington, has awarded the contract for the complete construction of a post office building, exclusive of heating and plumbing apparatus, at Bridgeport, Conn., to D. J. Curtis, of Springfield, at his bid of $101,300. Connecticut brown stone will be used in the work.

City Hall.—The following proposals for the construction of the new city hall have been received by the City Council, Omaha, Neb.

Lane Bridge & Iron Works, Chicago, Ill.: iron work only, $57,381.81.

Canfield, Ruare & Co., Omaha: Six bids, according to material, ranging from $231,000 to $246,000.

John F. Coots, Omaha: Eight bids, ranging from $203,630 to $212,060. The highest bid contemplates the cost of granite to the second-story windows. The lowest, the use of Carroll county stone for display work.

Riley, King & Wickham, Omaha: Four bids, ranging from $243,000 to $256,668.

PROPOSALS OPEN.

Pumps, Boilers, Etc.—Steam pumps, water pipes, boilers, tanks, drains, etc., for asylum cottages. C. T. FRASER, Commissioner, Department of Public Works, Toronto, Ont. Sept. 30.

Artesian Well.—About 1,300 ft. deep, flush joints, heavy casing; 1,000 ft. of 12 ins. diameter, and 300 ft. of 10 ins. CHARLESTON ICE MFG. CO., Charleston, S. C. Oct. 1.

Dredging.—About 25,500 cu. yds. in the North river at 39th St. THE DOCKS COMMISSIONERS, Pier A, North river, New York City. Oct. 1.

Boilers.—Two horizontal tubular boilers for North Brother Id. THE HEALTH COMMISSIONERS, 301 Mott St. New York City. Oct. 1.

Road.—Building about 200 rods of new road. Plans and specifications on file. Bids to state price per rod. THE BOARD OF SELECTMEN, Russell, Mass. Oct. 1.

Bridge. — Iron bridge, with foundations, over the Grande river at Glenwood Springs. J. P. MAXWELL, State Engineer, Denver, Col. Oct. 1.

Water Mains and Street Work.—Laying water mains; grading, flagging, curbing and repaving. THE COMMISSIONER OF PUBLIC WORKS, 31 Chambers St., New York City. Oct. 3.

Concrete.—Concrete floor, etc., for U. S. building at Baltimore, Md. J. H. WINDRIM, Supervising Architect, Treasury Department, Washington, D. C. Oct. 3.

Water Supply and Sewerage.—At Fort Snelling, Minn. A. F. ROCKWELL, Quartermaster, U. S. A., St. Paul, Minn. Oct. 5.

Wall.—About 400 ft. of protection wall at the navy yard, League Id., Pa. G. B. WHITE, Chief of Bureau of Yards & Docks, Navy Department, Washington, D. C. Oct. 8.

Asphalt Paving.—About 780 sq. yds. Col. O. ERNST, Office of Public Buildings & Grounds, War Department, Washington, D. C. Oct. 9.

Railway.—Double tracking the Grand Trunk Ry. between Gananoque and Belleville. JOSEPH HICKSON, General Manager, Grand Trunk Ry., Montreal, Canada. Oct. 9.

Bonds.—Purchase of General Fund bonds, issued for natural gas purposes; $675,000. The legality of these bonds has been decided by the courts. W. T. WALKER, City Auditor, Toledo, O. Oct. 9.

Jail.—County jail. The COUNTY COMMISSIONERS, Visalia, Tulare county, Cal. Oct. 10.

Bridge.—Iron bridge over Otter river. H. W. ADAMS, Mansion, Va. Oct. 12.

Street Work. — Grading, curbing, granite block and bowlder paving, crossings, etc. T. G. SMITH, President, Board of Public Affairs, Cincinnati, O. Oct. 14, 15.

Bridge.—Span 70 ft., 16 ft. roadway. ALBERT H. HIRST, Town Clerk, Hecker, Monroe Co., Ill. Oct. 15.

Court House.—Plans and specifications on file. JAMES WHITE, County Clerk, Woodstock, Ont. Oct. 15.

Bridge.—Iron highway bridge, with stone piers and approaches, across Big Wand river, in Wyoming; width of river, 300 ft. 6 ins. Plans and specifications to be submitted by bidders. The entire cost, including 3 coats of paint, is not to exceed $9,500. For further information apply to the U. S. Indian Agent, Shoshone Agency, Fremont County, Wyo. THOMAS J. MORGAN, Commissioner, Department of the Interior, Office of Indian Affairs, Washington, D. C. Oct. 21.

Brick.—For furnishing 1,300,000 brick. R. DELAPPE, Central Irrigation District, Colusa, Cal. Nov. 5.

MANUFACTURING AND TECHNICAL.

Brick Dryer. — I. & M. W. Wolff & Coleman, of Chicago, have issued an illustrated circular of the Chicago iron-clad brick and tile dryer, and other plant, for brickmakers' use.

The Pond Engineering Co. will furnish the Hutchinson, Kan., Water, Light & Telephone Co. with a 100 H. P. Armington & Sims engine, being the fourth engine of that make which the company has in its station. A new feature will be a clutch placed on the driving wheel, so arranged that, with the engine running steadily, the driving wheel can be run or not as desired. The Pond Co. will also furnish the Edison Illuminating Co., of Topeka, Kan., with Ireson leather link belting, and the Metropolitan Railway Co., of Kansas City, with a Tracy patent oil filter.

Nut Locks. — Tests are being made on the Atlantic Coast Line of Mr. C. C. Coleman's patent nut-lock. If satisfactory, it is probable that a company will be formed to engage in manufacture.

The Railroad Brake, Switch, Signal & Safety Gate Co., of New York, has been incorporated by GEO U. HAMM, JOHN HAHN, E. M. MOFFETT, and A. HAMILTON REAVY. Capital stock, $100,000.

A Second-hand Engine and Boiler, 25 to 30 H. P.; location not material, if on or near the Columbia or Williamette. Call on or address B. M. C., 103 Front St., Portland, Ore.

Boilers for Japan.—The Abendroth & Root Mfg. Co., of New York, has an order for 8 sectional safety boilers to be shipped to Yokahama, Japan. The company has been full of business for several months past and is erecting at Greenpoint an additional factory 200 ft. long by 175 ft. wide.

Cars.—The Harrisburg Mfg. Co., of Harrisburg, Pa., has orders for 200 hopper bottom gondola cars for the Pennsylvania R. R., and 400 oil tank cars for private lines.

The Ellis Car Co., of Amesbury, Mass., has built a car for the Boynton bicycle railway at Coney Island, N. Y.

The Erie Car Co., of Erie, Pa., has orders for 200 coal cars for the Pennsylvania R. R., 100 for the New York & New England R. R., and 100 for the Rainey Bank Coal & Coke Co.

The Iron Car Co., of New York, has ordered 1,500 cars from the Minnesota Car Co., of Duluth, Minn., and 250 box and 100 gondola cars from the Harrisburg Mfg. Co., of Harrisburg, Pa.

Cross Ties.—The Great Northwest Central Ry., of Manitoba, has contracted with Malcolm Thompson, of Rapid City, Man., for 35,000 cross ties.

Natural Gas.—The Indiana General Assembly at its last session passed a law to prevent the piping of natural gas out of the State. Its constitutionality was called into question, and in a test case, the county judge at Portland recently declared the law unconstitutional. The case was appealed to the Supreme Court, and the gas companies have combined to sustain the law.

Incline Railway.—J. M. Bernhard, of Lenoir, N. C., wants plant, cars, etc., for an incline plane for passenger traffic.

The Richmond Street Motor Co. has been incorporated at Richmond, Va., to manufacture motors, dummy engines, and small locomotives. Capital stock, $50,000. President, ALLEN TALBOTT; Vice-President and General Manager, WILLIAM SIMPKIN; Secretary and Treasurer, WM. P. DE SAUSSURE. Directors, ANDREW H. CHRISTIAN, Jr., R. G. RENNOLDS, F. H. MCGUIRE, NORMAN V. RANDOLPH, and GEO. B. GAINES.

The Chattanooga Steam Pump Co. has been organized at Chattanooga, Tenn., by D. P. MONTAGUE, D. GILES, and H. S. CHAMBERLAIN, to manufacture the Johnson steam pump.

Hoisting Plant.—The Brown Hoisting & Conveying Co., of Cleveland, O., is placing one of its hoists at West Superior, Minn., for the Ohio Coal Co. Also a plant at Fairport, O.; this will be used for handling ores on the Pennsylvania & Lake Erie docks. A plant has been put up at Piedmont on the Hudson, for the Lake Erie & Western R. R.; this plant will be used in handling coal. All these plants are similar to those in operation on the New York, Pennsylvania & Ohio R. R. docks at Cleveland. The firm is also building a cantilever derrick for Jones & Laughlin, Pittsburg; length of booms 306 ft. this derrick will be used for general purposes in the yard.

Ten-Wheel Locomotives.—The Michigan Central has four of the large type of ten-wheel passenger engines in service. They have 6 ft. drivers, 20 x 24 ins. cylinders, and are 68 ft. long from the front of the engine to the rear end of the tank. It is claimed that these engines will haul trains of 14 Pullman cars at great speed.

Car Works.—The U. S. Rolling Stock Co. is increasing the plant of its works at Anniston, Ala., and will enlarge the car capacity of the car department to turn out 20 cars per day.

Water-Works Supplies.—In *The Industrial World*, Sept. 12, 1889, the following paragraph appeared:—"A number of New York capitalists are proposing to build and operate in Pittsburg, Pa., a large works for the manufacture of water-works supplies, such as valves, hydrants, etc. The capitalization of the company is to be about $500,000. The mill will probably be located on the Pennsylvania Railroad." Can any of our readers give any further particulars in regard to this scheme, and inform us who are the parties interested?

Gas Engine.—The Portsmouth Gas & Electric Co., of Portsmouth, O., wants to purchase a second-hand gas engine, of 15, 20 or 30 H. P.

The Thurmond Car Coupling Co., of 45 Broadway, New York, reports business very brisk. Since July, 2,000 cars have been fitted with the coupler, and the company is now filling a large order. President, W. E. RAGAN; Secretary, WM. D. THURMOND.

The Westinghouse Machine Co., of Pittsburg, Pa., reports its business still growing. During the past five years its buildings have been extended from the square in Pittsburg originally occupied by the Westinghouse Air Brake Co. until they now cover two and a half blocks of contiguous property. Machinery has been added (much of it quite recently) until now the limit has been reached and there is no space for more. No additional property is available in the vicinity, and to keep pace with the constant growth of the business, the company is engaged in erecting a three-story warehouse for finished engines, repairs, etc., which will be provided with steam hoists, overhead cranes, and other appliances for the quick and economical handling of heavy weights. The company is also taking on a complete new force of workmen, so that the establishment will henceforth be operated continuously day and night.

BRIDGES AND CANALS.

Bridge Notes.—*Augusta, Me.*—The contract for removing the old wooden bridge over the Kennebec river, and building a new iron bridge, has been let to Cofrode & Saylor, of Philadelphia, Pa., at $25,000. There will be 1 span of 200 ft., and 2 of 100 ft. each. This bridge was incorrectly mentioned last week as at Bangor.

Clay County, Dak.—Three iron bridges will be built this fall.

St. Louis, Mo.—The caisson for the fourth and last pier of the Merchants' bridge has been towed out and is being sunk to the rock foundation. The contract for piling, yellow pine and oak for sills, etc., has been awarded to the St. Louis Wooden Gutter Co.

Jefferson City, Mo.—The completion of the pontoon bridge across the Missouri at Lexington has induced the formation of a company to build a similar bridge at this place. Hon. H. CLAY EWING and Capt. M. T. MOORE are interested.

Fort Smith, Ark.—The contract for the Poteau bridge has been let to the King Iron Bridge & Mfg. Co., of Cleveland, O., at $24,000.

Appleton, Wis.—The following proposals for the Lake St. bridge have been received by Mr. C. H. GILLETT, City Engineer. There will be 1 high Pratt truss span of 108 ft., 1 lattice girder span of 40 ft.; 1 high Pratt truss of 90 ft.; the roadway will be 18 ft. wide, with 2 sidewalks 6 ft. wide. Wisconsin Bridge & Iron Co., Wauwatosa, Wis., $5,330; Milwaukee Bridge & Iron Works, $5,477; Youngstown Bridge Co., Youngstown, O., $5,620; King Iron Bridge & Mfg. Co. Cleveland, O., $5,625; Pittsburg Bridge Co., Pittsburg, Pa., $5,650; Wrought Iron Bridge Co., Canton, O., $5,875; Geo. E. King Bridge Co., Des Moines, Ia, $5,940; Clinton Bridge & Iron Co., Clinton, Ia., $5,945; Chicago Bridge & Iron Co., $6,082; Smith Bridge Co., Toledo, O., $6,100; C. P. Jones, $6,400; Penn Bridge Co., Beaver Falls, Pa., $6,400. The contract was awarded to the Wisconsin Bridge & Iron Co.

New London, Conn.—The draw span of the new Thames river bridge for the Shore Line railway has been completed. The bridge is 1,422 ft. long. Mr. A. P. BOLLER is the engineer.

Hartford, Conn.—The Connecticut river toll bridge has now been made a free bridge, and will be managed by a bridge committee. The bridge was built in 1808.

Bloomfield, N. J.—The Board of Freeholders has awarded the contract for the Thornton St. bridge to Napoleon Adams.

Gallatin, Tenn.—The contract for a bridge across Town creek has been awarded to the Smith Bridge Co., of Toledo, O., at about $3,000. It will be 78 ft. long, with a 44 ft. roadway and 2 sidewalks 8 ft. wide.

Chattanooga, Tenn.—Work has been commenced on the county bridge, and Kavenagh Bros. are excavating for the foundation of pier No. 5.

Dalton, Ga.—The following proposals have been received for an iron bridge of 1 truss span, with cylinder piers, over the Conasauga river at Upper Kings Bridge, Whitfield county, Ga.: Geo. H. Crafts, Atlanta, Ga. (Smith Bridge Co., Toledo, O.), $1,775; Champion Bridge Co., Wilmington, O., $1,800; Southern Bridge Co., Birmingham, Ala., $1,895; Iron Substructure Co., Columbus, O., $2,000; Queen & Crescent Bridge Co., Cincinnati, O., $2,100; King Iron Bridge & Mfg. Co., Cleveland, O., $2,200. For wood lattice bridge on same piers: Geo. H. Crafts, Atlanta, Ga., $1,725; Robert Manly, Dalton, Ga. $1,800. The contract was awarded to G. H. Crafts for an iron bridge.

Rockford, Ill.—City Engineer DUNLAP has presented a report on the improvement of the bridge facilities of the city: A new bridge across the river at State St., 62 ft. wide, $62,500. If raised so as to pass over the railroad tracks on East Side, $80,000; having curb wall approaches and earth filling on Elm and Wyman Street, $97,000; having curb wall approaches, West Side, and iron trestle on East Side, $111,000. The cost of moving present bridge to Elm St. and making new spans, $48,700. Cost of new bridge on State and moving other to Elm, $111,000. If moved to Green or Cedar, $123,200.

Troy, N. Y.—The following proposals have been received by the Board of Contract for a stone arch bridge over the Poestenkill at Hill St.: Malone & McKenna, Troy, $20,280; Emmett Flagler, Troy, $20,643; Monte & Parker, Troy, $21,600; T. Casey, Troy, $22,203; J. A. Cavenaugh, Troy, $23,900; Troy Public Works Co., $25,000.

Denver, Col.—The contracts for the Larimer St., bridge over Cherry creek have been awarded as follows: the superstructure to the Lane Bridge Co.; the abutments to Geddes & Seerie; the removal of the old bridge to the King Iron Bridge & Mfg. Co., of Cleveland, O., at $4.50. The bridge is to have 3 trusses and 2 roadways; trusses to be 24 ft. apart from center to center, with 18 ft. clear headway. Two foot-walks, each 10 ft. wide from center of outside truss to center of hand rail. The floor will be 5 ft. above flood line and 12 ft. above ordinary stage of water. The creek at ordinary stages is dry; its bed is sand. Usual seasons for floods from May to September. The abutments are to be built by the city, and to be finished at top to suit design of bidder. Abutments built skew. Angle of current with line of bridge to be 77°. The bridge is designed to accommodate a double line of cable railway 3 ft. 6 ins. gauge. Tops of floor beams to be 24 ins. below top of floor at slot rails. Floor and slot rails for cable railway to be furnished by Cable Railway Co. and placed by bidder. The bridge will be built according to the general requirements of Theodore Cooper's new and revised specifications for 1888, except where certain changes are required.

East & West Alabama Railway.—The contract for bridge masonry has been let to W. F. Cook and H. L. Collier, of Atlanta, Ga. The contract for the 7 iron bridges for this masonry work, including the Coosa river drawbridge, has been awarded to the Atlanta Bridge & Axle Co., of Atlanta, Ga.

ELECTRICAL.

Electric Light.—*Winchendon, Mass.*—The town voted on Sept. 16 to put in electric lights. For particulars address E. S. MERRILL.

Syracuse, N. Y.—The Council wants 130 additional electric lights and is willing to pay $9 per night, but the Electric Light & Power Co. asks $12.

Allegheny, Pa.—The contract for erecting an electric light plant for the lighting of the city for $141,158, adopted in Common Council, has been passed finally in select council by a unanimous vote.

Harrodsburg, Ky.—Electric lights are to be put in very soon.

Kansas City, Kan.—The Consolidated Electric Light Co. has offered to furnish the city with incandescent lights at the points where gas lamps are now being used for $20 per light per annum.

Dallas, Ore.—The City Council has granted a franchise to Riley, Coad & Shreve for electric lights. It is the intention to put in the plant immediately.

San Mateo, Cal.—At a recent meeting of the Trustees the matter of electric lights for the county road in the First Township was taken up, and a proposition from the California Electric Light Co. was received. The company offered to place masts ¾ mile apart, and to place on each mast 4 electric lights of 4,000 c. p. each, at a cost of $1.10 per night per light.

San Antonio, Tex.—The Electric Light & Power Co. put in a bid for 100 arc lights and 175 incandescent lights at $1,869 per month. Gas lighting was adopted, however.

Hamilton, Ont.—The gas company has been awarded the contract for supplying the city with 230 arc and a number of incandescent lights. The company will put in a complete plant.

Jamestown, N. Y.—Proposals are invited for electric lighting. The lights will be of 1,200 c. p.

Lexington, Va.—An electric light franchise has been applied for by C. W. IRVINE, J. T. FORBES and C. B. GOYER.

Birmingham, Ala.—The Merchants' Electric Light & Power Co. proposes to issue $5,000 or $10,000 in bonds for improvements.

Weston, Va.—An electric light plant of 15 or 20 arc lights of 2,000 c. p. and 300 incandescent lights of 16 c. p. is to be put in. Electric plant is wanted. Address JOHN S. MITCHELL, Box 68, Weston, W. Va.

Montreal, Canada.—The Montreal Gas Co. has made an offer to supply gas for street lighting at the rate of $18 per lamp per annum, provided not less than 750 lamps were used on the terms of the old contract. The company also offered electric lighting for 10 years with lights of 2,000 c. p. at 28 cts. per night, or $102 per annum for the first 5 years, and 25 cts. or $91 for the next 5 years. The company offered to use the latest improvements of the Brush, Edison, and Westinghouse systems, to supply either iron or wooden poles, and to give the light 7 months after the contract is signed, gas being used in the meantime. They will also undertake to lay underground wires on payment of an extra sum.

Electric Light Poles.—At Springfield, Mass., the contract for furnishing and erecting electric light poles and arms was given to the Marr Construction Co., of Boston. The price for sawed and smoothed yellow pine poles, 25 ft. long, 6 ft. in the ground, was $10; 30 ft. poles, $14; 35 ft. poles, $15.50. The 25 ft. poles were 8 x 8 ins. at the butt; the 30 and 35 ft. poles were 10 x 10 ins. at the butt. The price for poles included iron steps put on. Russel arm, 15 ft., erected, $19.25 each; Brady arm, 15 ft., erected, $17 each.

SEWERAGE AND MUNICIPAL.

Street Work.—*Boston, Mass.*—The Superintendent of Streets has been directed to grade Bothnia St., at an expense of $2,000, and to macadamize St. Paul St.

San Francisco, Cal.—A bituminous rock pavement is to be laid on Kearny St. The specifications prepared by Mr. ASHWORTH, Superintendent of Streets, have been approved.

Toronto, Ont.—The Board of Works has been considering the methods of sewage disposal suggested by Capt. HARSTONE and Mr. W. J. SMITH. The former represents the Conder system in which the sewage is treated in the sewers. The council will be asked to spend $1,000 to test this system in the Yonge St. sewer.

Sewers.—*Boston, Mass.*—The City Treasurer received proposals Sept. 24 for the bonds of the improved sewerage loan, amounting to $500,000.

Far Rockaway, N. Y.—The Board of Village Trustees has elected MARTIN B. BROWN, JOHN TORREY, THOMAS HEMLEY and W. W. JONES as Sewerage Commissioners. It is their intention to adopt the system of sewerage now in use at Atlantic City, N. J. They will also improve the roadways and sidewalks, and propose to commence the work immediately and finish it before winter sets in. The contract has been given to W. S. West, of 77 Lexington Ave., Brooklyn.

Morgantown, W. Va.—A vote will be taken Sept. 28 on the proposition to issue bonds for a sewerage system.

Jackson, Tenn.—Proposals will be received by the mayor, JOHN W. GATES, until Oct. 1, for furnishing and laying vitrified sewer pipe: 1,950 ft. of 20-in., 900 ft. of 14-in., 3,650 ft. of 12-in. and 18,700 ft. of 8-in.; with 73 manholes and 6 flush tanks. Proposals will also be received for furnishing materials and constructing 1,950 lin. ft. of brick sewer 2 ft. in diameter in substitution for the 20-in. vitrified pipe. J. D. COOK, of Toledo, O., is consulting engineer.

Meridian, Miss.—At a recent council meeting the proposition of Mr. P. K. YATES was taken up and thoroughly discussed, the consensus of opinion being that the matter should be left to the people to decide, and that the next Legislature be requested to authorize the city to vote bonds if the citizens should so desire, and then have sewers built by contract and owned by the city. There is no doubt of the necessity of a proper system of sewerage, and as the question is being agitated

a complete survey of the city for that purpose will no doubt be ordered soon, with Okatibbee creek as an outlet.

Duluth, Minn.—The contract for a sewer on 4th St, between 7th and 10th Aves., has been awarded to Frank W. Farnham. A sewer is to be built in 1st St. between 2d and 6th Aves.

Portland, Ore.—The new sewerage commission has held its first meetings. The City Surveyor will prepare a map and statement of grades for the use of the commission. Dr. S. E. JOSEPHS, Mr. DALTON and Mr. LAMBERT have been appointed a committee to confer with sanitary engineers. It will be necessary to have the Legislature make some amendment to the city charter to give the city enlarged power. The charter now provides for sewerage the same as street improvements. It would be necessary to have several main sewers running through the city, and it will have to be settled how and by whom these are to be paid for.

WATER-WORKS.

NEW ENGLAND.

Ellsworth, Me.—A. W. CUNNINGHAM sends us the following:

The city has contracted with the Ellsworth Water Co. for fire service, paying them a rental of $1,800 per year for 20 years. The Ellsworth Water Co. has contracted with Joseph Winnitt & Son, of Portland, to put in a system of works to be completed Dec. 31, 1889. They are now laying pipes through the streets.

Fort Fairfield, Me.—The following information is from E. H. GOWING:

The contract for gravity works complete has been awarded to W. H. Whitcomb, of Norway, Me., by the Frontier Water Co. Work was begun in May, and is to be completed in October. The supply is taken from Grass brook. The officers are: President, NICHOLAS FESSENDEN; Treasurer, J. F. HOCKER; Clerk, E. L. HOUGHTON; E. H. GOWING, Engineer. Population, 3,500.

Caribou, Me.—H. M. HEATH, of Augusta, Secretary and Manager, sends us the following:

The new works will be completed about Oct. 15. There will be 4 miles of 4 and 6-in. pipe and 26 hydrants. Water is pumped from Aroostook river to a 151,000-gall. stand-pipe, by a 1,000,000-gall. duplex Blake pump. President, GEO. I. FRICKEY; Treasurer, H. M. HEATH; Superintendent, A. B. FISHER: Designing Engineer, M. M. TIDD, of Boston. Constructing Engineer, FREELAND JONES.

Wolfborough, N. H.—We have received the following from S. A. EDGERLY:

Bonds have been sold for works to cost $4,500. Water will be pumped from Beach pond to a reservoir. Engineer, JOHN L. PEAVEY, of Springfield.

A later report states that FRANKLIN A. SNOW, of Providence, R. I., has been awarded the contract for constructing complete works.

Greenfield, Mass.—Work on the Glen reservoir will probably not begin until spring.

Springfield, Mass.—A report upon the much-talked-of water supply question has been presented by the State Board of Health, in which the method of intermittent filtration upon 15 or 20 acres of land, near Five Mile pond, is recommended; also a careful and elaborate investigation by a competent engineer before money is spent for improvements in any other direction. A report is soon to be made by the local Board of Commissioners.

Providence, R. I.—The Fruit Hill high service reservoir has been completed. It is 75 ft. above the highest point in the city, has an area of about 3 acres, and a capacity of 25,000,000 galls. Work was begun Sept. 1, 1887, with James J. Newman as contractor. The estimated cost is $135,000.

New London, Conn.—The water supply system is to be greatly improved. Address W. H. RICHARDS, Superintendent.

MIDDLE.

Ronses Point, N. Y.—F. S. Peck, Engineer, of Watertown, N. Y., informs us that the following bids were received on Sept. 20, for constructing complete water-works. The contract was awarded to Charles Brown. Chas. Smith, Syracuse, N. Y., $26,000; Leonard & Shepherd, Scranton, Pa., $24,750; Chas. Brown, Mohawk, N. Y., $23,569.47. The pumps will be furnished by the Gordon Steam Pump Co., of Hamilton, O.; hydrants and valves, by the Galvin Brass & Iron Works, of Detroit, Mich.; pipe by New Phila. (O.), Pipe Foundry; boiler and water tower by the Phœnix Foundry & Traction Co., of Syracuse.

Hamburg, N. Y.—The Sharon (Pa.) Boiler Works is to furnish a 125-ft. stand-pipe for the new works.

Brooklyn, N. Y.—The Board of Supervisors of Suffolk Co. met at Riverhead recently, and passed resolutions requesting the Commissioners of the Land Office not to grant the applications now under consideration for gifts of land and water at Smithtown and Orient.

Canton, N. Y.—A stand-pipe 72 ft. high is to be furnished by the Sharon (Pa.) Boiler Works.

Troy, N. Y.—The middle service reservoir is to be cleaned and repaired. The well-house is also being repaired.

Saratoga, N. Y.—It has been decided to test the new 8,000,000-gall. Gaskill engine, at the Loughberry lake pumping station, Oct. 1. It was built by the Holly Mfg. Co. of Lockport.

Watervliet, N. Y.—Additional daily supply of 9,000,000-galls. is reported as being obtained from the new wells recently sunk on Maple island. About 30 wells have been sunk to an average depth of 60-ft.

Amsterdam, N. Y.—The water commissioners have been inspecting the survey for carrying the water from Hans creek to Amsterdam. It is proposed to start from Voorhees's mill, in Providence, Saratoga county, and run southwest across Providence, and Broadalbin and Perth, in Fulton county, to Amsterdam with 20-in. pipe, for supplying water to Amsterdam. It is expected work will commence early the coming spring. It is said the distance will be about 16 miles.——Health Officer STOVER and Prof BROWN, in behalf of the State Board of Health, are investigating the source, character, and quality of the water of the reservoir.

Flushing, N. Y.—Daniel A. Moran, of New York, has purchased twenty-five $1,000 refunding water bonds at a premium of 28¼ per cent. The bonds which bear interest of 5 per cent., are payable at the Seventh National Bank of New York, Oct. 1, 1914.

Lansingburgh, N. Y.—The Troy works have been granted permission to lay pipes on First street, between Second and Fifth avenues.

New York, N. Y.—A 12-in. main at 177th St. broke on the night of Sept. 23. The break was at the intersection of the street with the New York & Harlem Ry. tracks. A piece of the main was cut out last fall to permit the lowering of the tracks. The contractors plugged the ends of the pipe with wood, and fastened the plug with a half-inch manilla rope. Since the pipe was cut a heavy masonry abutment for a bridge has been built at the west end of the cut, in front of the end of the pipe. On Tuesday night the plug was driven out by the force of the water. The water from the main came through the abutment, and flooded the track for some distance. Added to this, the escaping water endangered the temporary wooden bridge over the cut. Incoming trains were delayed 2½ hours. The damage was comparatively slight, but the danger of further damage was considerable.

New York, N. Y.—A public hearing has been given by the Aqueduct Commissioners to discuss building a dam and reservoir to be known as reservoir D. The arguments were all in favor of its construction, and steps will probably soon be taken to let contracts and begin work. ——Commissioner of Public Works GILROY, in his estimate of expenses for 1890, recommends an increase of $130,200 for aqueduct purposes in enlarging the reservoir in Central Park, and removing a gate-way in Ninth avenue.

Syracuse, N. Y.—Hearings on the Skaneateles lake question have recently been given by the New York Produce Exchange, and by the Canal Board, at Albany, to delegations of citizens from Syracuse and Buffalo.

Allegheny, Pa.—The pipes which have been distributed along the streets since February and March last are now being placed under ground.

Plainfield, N. J.—The Committee on Water has reported in favor of accepting the proposition of Charles K. Moore and Edward A. Lovell, of New York, to construct works. They agree to lay 25 miles or more of pipe, and erect stand-pipes and engines capable of supplying 500,000 galls. of water daily. Definite action will be taken on Sept. 30.

Pittsburg, Pa. — The Monongahela Water Co. has filed an answer and plea to the suit of H. SELLERS MCKEE and others against it, stating:

The answer says that the purchase of the Manufacturers' Water Co. was made pursuant to a unanimous vote of the stockholders of the Monongahela Water Co., in which vote the plaintiffs participated; that subsequent to the purchase the plaintiffs received and accepted and still hold their proportionate share of the stock of the defendant company distributed by T. B. ATTERBURY, trustee for the stockholders. Upon this stock they have received and receipted for dividends both before and since the filling of this bill. The court, for these reasons, is asked to dismiss the bill with reasonable costs.

Philadelphia, Pa.—Dr. CHARLES M. CRESSON, in a letter recently written on the subject of "Settling and Filtering Drinking Water," as a means of purification, stated: "Filtration may render turbid waters bright and transparent, but it cannot remove the soluble filth with which they are polluted." He recommends the abandonment of the Schuylkill river, and that immediate steps be taken to locate a new source of supply.

Washington, D. C.—A petition has been received by the Water Commissioners, asking that the well in Mount Pleasant be cleaned and repaired.

SOUTHERN.

Roanoke, Va.—The Roanoke Gas & Water Co. has contracted with the Holly Manufacturing Co. to furnish a duplicate pumping plant.

Richmond, Va.—Superintendent CHAS. E. BOLLING is reported as saying that a new storage basin should be constructed above the new pumping station, from which the supply could be drawn during the periods when the river is muddy.

Wheeling, W. Va.—The new reservoir, located at North Wheeling, has been completed and put into use. It is also reported that new pumps and boilers will probably be purchased.——The Junction Iron Co. will build a new pump-house to supply their iron mill with water.

Huntington, W. Va.—It is reported that a contract has been made with the Cook Well Co., of St. Louis, Mo., to sink wells furnishing 2,000,000 galls. daily, at $5,000.

Henderson, N. C.—We have received the following from W. H. BURGOYN:

The citizens expect to secure works within the next year. A charter was granted to me for a company at the last session of the Legislature to construct them. Nothing further than correspondence has been accomplished.

Hendersonville, N. C.—Bonds for constructing works have been sold. Work will probably be commenced soon.

Charleston, S. C.—About four miles of mains are to be laid during November and December. The company is also making preparation to construct a new reservoir, the work on which is to be pushed as rapidly as possible.

Savannah, Ga.—The city supply has run short several times, and steps are being taken to learn whether it is from leakage or waste.

Waycross, Ga.—An act has passed the Legislature authorizing the construction of works.

Milledgeville, Ga.—A move is being made by the citizens to convey the water-power from the falls above the city by means of electricity into the heart of the city, whence it will be utilized in running factories, etc. Surveys have been made, and experts have recently examined this power, and estimate that it can be brought to the city for $30,000.

Fernandina, Fla.—A system of works has been constructed and accepted. The contractors were the Jeter & Boardman Gas & Water Association, of Macon, Ga. Work was begun in March, 1889.

Troy, Ala.—Address the Mayor for information regarding the projected works.

Eufaula, Ala.—It is reported that A. M. BALDWIN, of Montgomery, has purchased the works from the company, and proposes sinking artesian wells from which to draw the supply.

Opelika, Ala.—Works are needed.

Wartrace, Tenn.—It is reported that the Nashville, Chattanooga & St. Louis Railway Co. (office, Nashville) is improving its works.

Paris, Ky.—J. M. THOMAS has sent us the following information:

The Paris Water Co. will probably build works costing $30,000 to $50,000. No contracts have been made, and nothing definite has been decided upon. Population, 6,000.

Highlands, Ky.—A. H. YOUNG, U. S. A., informs us that the following bids for the pipe and tower have been received: Michael Stopper, Cincinnati, O., $11,550; P. Murron & Sons, Cincinnati, $10,955; Chas. Sundberg & Son, Chicago, $11,744.

NORTH CENTRAL.

Cambridge, O.—Address the City Clerk for information regarding materials for the works soon to be constructed.

Cincinnati, O.— The Eden park pump-house, Mr. Finnegan, Contractor, is to be completed in June, 1890.

Indianapolis, Ind.—No further steps have been taken by the citizens or the Board of Trade to sink the artesian well in Market Place, at an estimated cost of $10,000, as an experiment with wells as a new source for the city's supply.

Marshall, Mich.—The new works have been satisfactorily tested. Mr. SAUNDERSON is Superintendent.

Wyandotte, Mich.—T. J. LANGLOIS, President, sends us the following information:

The construction of works to be owned by the city was begun on Sept. 17. Estimated cost, $50,000. The contractors are: Hughes Steam Pump Co., Cleveland, O., for a 3,000,000-gall. pumping engine. Pipes and specials, Addystone Pipe & Steel Co., Cincinnati, O. Trenching and pipe laying, W. H. Myers, Hillsdale, Mich. Valves and hydrants, Galvin Brass & Iron Works, Detroit, Mich. The supply is to be pumped direct to mains from the Detroit river. There will be 8 miles of 16, 14 and 12-in. pipe, and 85 hydrants. Engineer, J. D. COOK, Toledo, O. President, T. J. LANGLOIS; Secretary, J. S. MCGLAUGHLIN, Jr.; Treasurer, WM. DENMAN; Superintendent, H. N. OCOBOCK. Population, 5,000.

St. Ignace, Mich.—WM. SOULSON, President, informs us the new works will be completed about Dec. 1. All contracts have been let. GEO. C. MORGAN, of Chicago, is Engineer and Contractor.

St. Johns, Mich.—The new works will be completed about Oct. 15. All contracts have been made. CHAS. P. BAKER is Secretary.

Ypsilanti, Mich.—The city has voted an additional appropriation of $50,000 for the new works.

Mounds Junction, Ill.—Works are to be established by the Illinois Central R. R. The supply will probably be taken from the Cache river, and piped to a series of reservoirs.

Springfield, Ill.—The Illinois Water & Light Co., of Shelbyville, has been incorporated to erect water and light plants in Shelbyville, Mattoon, and Belleville. Capital, $300,000. The incorporators are: J. W. LLOYD, WILLIAM F. THORNTON and HENRY C. ROBERTSON.

Pinckneyville, Ill.— Bids were received on Sept. 23 for constructing complete works. E. C. HAYES is City Clerk.

Peoria, Ill.—The company has submitted samples of water for analysis from the new well from which they propose supplying the city.

Buckley, Ill.—J. M. LINCKENMEYER, Village Clerk, sends us the following information:

A small system of works will be completed about Oct. 1. The U. S. Wind Engine & Pump Co., of Batavia, are the contractors. There will be ¼ mile of 4-in. mains and 5 hydrants. Estimated cost, $2,000. Debt, $500. President, JOHN HEANLY; Clerk, J. M. LINCKENMEYER; Treasurer, JACOB HEIST. Population, 500.

Princeton, Ill.— We have received the following from C. J. MCMANIS:

Propositions will be received from Civil and Hydraulic Engineers until Oct. 1, 1889, for the following:

To prepare plans and specifications and superintend the construction of a system of water-works in the city of Princeton, Ill. Twenty-five thousand dollars have been appropriated for the construction of the same. All applications to be accompanied by references.

All communications to be addressed to I. O. BROKAW, City Clerk. By order, Water-Works Committee.

Jerseyville, Ill.—J. S. DANIELS, Chairman Fire and Water Committee, informs us that the new works have just been completed. Water is pumped from a 2,003-ft well to a reservoir, thence to a tank 135 ft. high, by a 750,000-gall. Deane pump.

Ripon, Wis.—The Ripon Water Co. has been incorporated. Capital stock, $80,000. The incorporators are: C. E. GRAY, J. R. GRAY and G. A. FARWELL.

Whitewater, Wis.—C. E. GRAY, Jr., of Chicago, informs us that the new works will be completed about Oct. 1. Estimated cost, $80,000.

NORTHWESTERN.

Glenwood, Ia.—Work on the artesian well has been delayed by the caving in of the soft earth through which the bore passes; special tools having become necessary. It has reached a depth of 965 ft. Definite plans will be made to establish complete works as soon as a sufficient flow is obtained. SETH DEAN is the Engineer in charge.

Sibley, Ia.—A subscription paper is being circulated for the purpose of raising funds to sink a 4-in. well to supply water for the city.

Anoka, Minn.—The Porter Mfg. Co., of Syracuse, N. Y., is to furnish a new stand-pipe.

New Ulm, Minn.—Works are to be established. Address the Town Clerk.

Lakeside, Minn.—The Village Council is soon to vote upon the passage of an ordinance granting the Lakeside Light and Water Co. a 30 years' franchise to construct and operate water, gas, electric light and power works. Address W. C. SARGENT, Village President, or C. F. WEST, Village Recorder.

Fort Snelling, Minn.—Sealed proposals will be received until Oct. 5, for extending the water supply and sewerage facilities. Address A. F. ROCKWELL, Chief Quartermaster U. S. Army.

Belleville, Kan.—The contract for furnishing material and constructing works has been awarded to S. K. Felton, of Omaha, Neb., at $35,000. Contracts for all materials have been awarded.——It is reported that Ripley & Bronson, of St. Louis, Mo., have been awarded contracts to furnish 325 tons of cast-iron pipe, hydrants, valves, etc. for the new works.

Baxter Springs, Kan.—H. R. CROWELL has sent us the following:

A franchise for works is now before the City Council awaiting its consideration.

Fremont, Neb.—Work on the improvements has been begun.

Seward, Neb.—The Pond Engineering Co., of St. Louis, Mo., has been awarded the contract for furnishing a 100,000-gall. duplex Holly pump, with the necessary boiler, heater, etc., for the new works.

Grant, Neb.—The new works were completed on Sept. 9.

Geneva, Neb.—A. A. RICHARDSON, Engineer of the new works, of Lincoln, Neb., informs us that the following contracts have been awarded:

For furnishing a stand-pipe, John Harris, $980; Pipe, Shickle, Harrison & Howard, St. Louis, $31.75 per ton; Gaskill pumping engine, 1,000,000-galls. capacity, Pond Engineering Co., St. Louis; Boilers (2), $1,380; Adam's hydrants, Tamaqua Mfg. Co., $31 each. Two wells, 200 ft. deep, Cook Well Co., of St. Louis, $2,400; Valves U. S. Wind Engine & Pump Co., of Omaha, $448.50; Engine house, J. Dunham, $1,425.

Scotland, S. Dak.—Jos. V. TEIBEL, City Clerk, has sent us the following:

The contract for complete works has been awarded to Fairbanks, Morse & Co., of St. Paul, Minn., at $10,200. The following material will be required: 3,166 ft. 6-in., 1,560 ft. 4-in. pipe; 7 hydrants; one 12 H. P. boiler; two 6-in. and one 4-in. valve; pumping engine, 1,000,000-gall. capacity; one windmill and pump, 24 x 28 ft. frame pump house. Water tower, 107 ft. high; tank to be 18 ft. high, 24-ft. diameter, all of wood and iron.

Devil's Lake, Dak.—C. M. FISHER, City Auditor, sends us the following information:

The well has been completed, but it is not a complete success. Sand was struck at a depth of 1,500 ft., which forced its way up the pipe for 300 ft., rendering the water unfit for use. A daily flow of about 1,200 to 1,400 bbls. is now obtained. The contractors are awaiting final results to see if the flow will continue and the water become clear. The town is desirous of corresponding with parties who can make suggestions for sinking the well below the quicksand. Nothing will be done to establish works until a better supply is obtained.

SOUTHWESTERN.

St. Louis, Mo.—The city is taking steps to secure its supply from the Mississippi river, at a point seven miles above Bissell's Point. The estimated cost of the work is 3,000,000.

Cuero, Tex.—GEORGE H. LAW, City Secretary, informs us that the contract for constructing works has been awarded to GUIDO JAEGER, of Havana, Ill., at $33,942.62. Work is to begin within 30 days, and be completed by April 1, 1890.

Cleburne, Tex.—Improvements are projected.

Pueblo, Col.—At a recent meeting of the trustees it was decided to lay about three miles of new mains, mostly 6 in., at once. A main will be laid to Irving place and another to Avondale and Mattice's addition on the east side.

Trinidad, Col.—A new supply main, four miles long, is being laid.

Siloam Springs, Col.—JACOB A. HARMAN, of Glenwood Springs, is making preliminary surveys for a system of works.

Denver, Col.—The question of the city purchasing the company's plant will probably be voted upon at the fall election. It is also reported that the company contemplates making extensive additions and improvements.

Tacoma, Wash.—We have received the following information from the Tacoma Light and Water Co.:

Large extensions will be made during the next twelve months. Plans will be adopted in about 30 days. New mains are being laid as rapidly as possible.

Seattle, Wash.—Sealed proposals for furnishing 25 hydrants were received on Sept. 20. C. W. FERRIS is City Clerk.

Salem, Oregon.—The Penitentiary commmissioners have opened bids for a water tower and tank as follows: G. A. Stephens, Salem, $2,598; Rankin & Co., Salem, $3,270; Colter & Miner, Portland, $3,300. The contract was let to G. A. Stephens.

Albina, Oregon.—The special election to decide whether the city should issue bonds and own its own works resulted in 35 votes being cast in favor of the bonds, and 91 against their issue.——A proposition has been received from CHARLES E. OLIVER by which he offers to construct a complete new system of works for $8,500——A proposition from E. C. LARKIN has also been received.

Arch Beach and Laguna, Cal.—The Arch Beach and Laguna Water Co. has been incorporated to furnish clear mountain water for domestic use, etc. [See note under "Irrigation."—ED.]

Red Bluff, Cal.—W. T. Garrett & Co. of San Francisco have made the following report on the cost of works.

Pair duplicate pumping engines joint capacity, 75,000-galls. per hour; boilers, engine houses, $10,000. Reservoir, capacity, 1,000,000 galls., $4,200; 23,950 ft. pipe, from 4 to 13 in. hydrant, etc., $36,000.

San Gabriel, Cal.—A meeting of the stockholders of the Alhambra Addition Water Co. will be held on Nov. 23 to consider the propriety of creating a bonded indebtedness for the sum of $25,000, and to authorize the issuance of bonds to that amount, said bonds to be secured by a mortgage or deed of trust upon all the property of the corporation. T. G. HAINES is Secretary.

Santa Cruz, Cal.—Work will be commenced at once. $300,000 of bonds have been sold, $270,000 to a New York firm, which is also to construct the works.

Murphy's, Cal.—The reservoir near Altaville, belonging to the Utica and Angels Quartz Mining Co., burst on Sept. 16, breaking two lines of pipe of the Utica and Stickles Mining Co.

Salt Lake City, Utah.—It is reported that the City Watermaster has capped the city's drive wells recently put down in Utah county, and that they are yielding about 4,000,000-galls. of water daily.

CANADA.

St. Cunegonde, P. Q.—The vote on the by-law providing a loan of $400,000 for water-works and other purposes resulted in 142 votes for the by-law and 13 against it.

Toronto, Ont.—It is proposed to expend $90,000 in improving the St. Albans ward pumping power. The matter has been referred to the Superintendent and Water Committee. —A new main is to be laid on Jones avenue.

Niagara Falls, Ont.—Tenders addressed to JOHN ROBINSON, Town Clerk, and marked "Tenders for Debentures," will be received till noon of Oct. 15, 1889, for the purchase of $77,500 of 5 per cent. water debentures, issued by the Corporation of the Town of Niagara Falls, under by-law No. 229 and payable in 30 years.

Lucknow, Ont.—Bids are wanted for constructing works. Address H. MORRISON, Clerk.

Campbellford, Ont.—The new works will be completed about Oct. 20.

Ingersoll, Ont.—Moffatt, Hodgins & Clarke, of Watertown, N. Y., have made the following proposition to the City Council: To lay all pipes, put in hydrants, and assume all expense of putting in the system, receiving in return a hydrant rental of $50 yearly, each; they supply, for private use, six rooms at $6 per year; lawn service at $5 per year, and offices and stores at the same rate; they will supply free water for watering the streets, and will also place a hydrant at the market square and one of the park free of charge.

Toronto.—Asylum Cottage at Minico, Ont.—Sealed tenders will be received on Monday Sept. 30, for the construction of steam pumps and water supply pipes, steam boilers, water tanks, also for drains, cisterns, and pumping engine house, steam boilers, and heating apparatus by C. F. FRASER, Commissioner Department of Public Works, Toronto.——Also for an addition and steam boiler for the engine house at the reformatory for boys, Penetanguishene. Address C. F. FRASER, Commissioner Department of Public Works, Toronto.

Chatham, Ont.—The following resolution has been adopted by the City Council:

That this committee recommend the Council to advertise in ENGINEERING NEWS of the United States, for tenders to build and operate a system of works for the town of Chatham, to have 12 miles of mains and 150 hydrants.

ARTESIAN WELLS.

Luzerne, N. Y.—H. Holliday has driven a well on his lot and found an abundance of water at a depth of 16 ft.

Allegheny, Pa.—Superintendent SAMUEL HARRIS is engaged in sinking a large well. Estimated cost, $10,000.

Charleston, S. C.—Bids will be received until Oct. 1, for sinking a 1,300-ft. well, 1,000 ft. 12-in., 300 ft. 10-in., by the Charleston Ice Mfg. Co.

Jacksonville, Fla.—The well at the county jail has reached a depth of about 500 ft. The drill is now in a flint rock.

Savannah, Ga.—The well on the Springfield plantation has been cleaned out by Contractor Joyce, and about two-thirds of the amount of flow obtained before the accident is again obtained.

Terre Haute, Ind.—A good flow of water has been obtained by DAVID BRONSON, at a depth of 1,780 ft.

Belleville, Ill.—A well is soon to be sunk at the distillery.

IRRIGATION.

Ogalalla, Neb.—The citizens have appointed a committee to meet and confer with the irrigation commission recently appointed by Congress, when that body goes west.

Santa Ana, Cal.—A number of citizens of Santa Ana and Arch Beach have organized a stock company, and have filed articles of incorporation for the Arch Beach & Laguna Water Co. The purpose of the company is to furnish clear mountain water for Arch Beach and Laguna residents, besides irrigating a large scope of tillable land lying at the foot of the mountains north of Arch Beach. The supply of water will be obtained 4 miles north of Arch Beach and adjoining the mountain canon, from an artificial lake which will receive its water from an underground stream recently discovered. The southern portion of Orange county will be greatly benefited by the successful operation of this company, and a vast area of land reclaimed.

Gothenburg, Neb.—The contract for constructing the canal has been awarded to Messrs. Franklin and Carroll, of Denver. Preparations are being made to commence work at once. C. W STANSEL, of Kearney, Neb., is Manager, and H. V. AUSBURN, is Superintendent, of the Canal Co.

Anaheim, Cal.—An election to decide whether $600,000 in bonds shall be issued by the Anaheim Irrigation District will be held Sept. 28.

Orlanda, Cal.—J. H. ROGERS, Secretary of the Board of Directors of the Kraft Irrigation District will receive proposals for $50,000 of 6 per cent. bonds, being part of an issue of $80,000.

Washington Ter.—Private parties are making surveys for two large irrigating canals to carry water from Yakima River to the upper bench of Kittikas Valley, W. T., where there are thousands of acres of rich Government and railroad lands.

Salmon City, Idaho.—A large irrigating canal was recently surveyed to take the water from Salmon River just below the city which would reclaim about 3,000 acres on the west side of Salmon River. The contract has been let to Thos. Holbert at $5 per rod and about 60 rods is already completed.

Chicago, Ill.—The office of the Pecos Irrigation Co., is to be removed to Colorado City, Col. New officers have been elected as follows: President, J. J. HAGERMAN; Vice-President, CHARLES B. EDDY; Treasurer, R. W. TANSILL; Secretary, L. H. JACKSON.

Watkins' Pipe Jointer.—As showing how progress is being made in Johnstown, Pa., we append the following from THOMAS WATKINS, whose house and shops were washed away by the great flood in May, and to whom we called attention in a previous number of this journal:

JOHNSTOWN, PA., Sept. 23, 1889.

DEAR SIR: I am now in position to continue the manufacture of the Watkins' Patent Pipe Jointer, having put up a new shop and machinery, my old establishment having been washed away by the recent flood. All orders received since June 1 will now be promptly filled upon receipt of your advice, as well as new orders. Your valued patronage is solicited. Respectfully,

THOMAS WATKINS.

[Here is a chance for practical philanthrophy. If Mr. Watkins' Pipe Jointer is a good tool, by all means help him with an order while helping yourselves.—Ed.]